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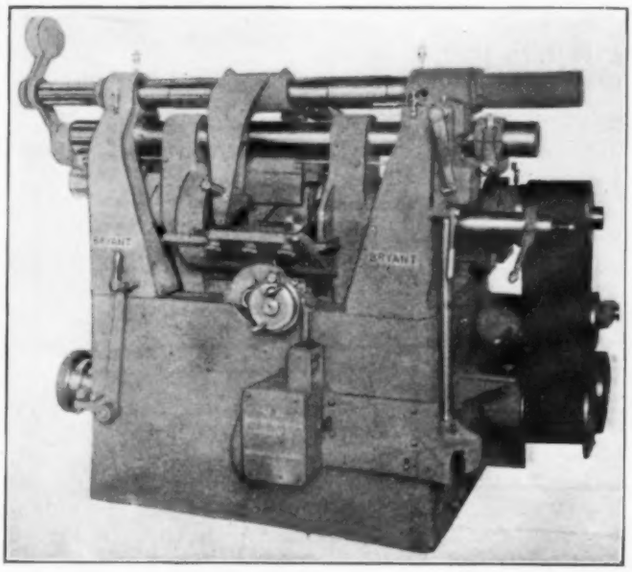
# The Bryant Form-Grinding Machine

## Forms Ground with One Movement—Wide-Faced Wheels Used—Machine Easily Controlled—Wheel Bearings Mounted on Rigid Base

By ELLSWORTH SHELDON
Associate Editor, *American Machinist*

THE development of the process of grinding as a means of production has been, in the past two decades, little short of marvelous. Starting about the year 1905 with the introduction of a machine for grinding crankshafts, wherewith material was removed by feeding the grinding wheel straight toward the center of the work without traversing it, and thereby accomplishing in a few minutes a job that had hitherto required in some cases hours to produce, each year has witnessed some new adaptation of the machine or some new application of the process, until the grinding machine now stands almost on a par with the lathe in the matter of versatility, and in many respects far surpasses that machine in productive capacity.



No so many years ago, mechanics looked askance upon the proposition of taking heavy cuts with a wheel 2 in. wide. Even if the work would stand the pressure, they said, and the heat generated by the wheel could be taken care of, the wheel itself would break down and continuous accurate work would be out of the question. Experience has proved, however, not only that their fears were unwarranted, but also that both work and wheel were capable of assuming the burden of much heavier cuts, distributed over much wider wheel-faces than the sponsors of the method had then dreamed of.

The latest application of this phase of the grinding process is demonstrated by the machine shown in the headpiece of this article and in the accompanying illustrations. The Bryant No. 40 form-grinding machine regularly grinds pieces 10 in. long and of any diameter up to 12 in., by feeding the wheel straight toward the center of the work with a traverse of only $\frac{1}{8}$ in.; and even this slight movement may be dispensed with if necessary. Not only are cylindrical pieces of work reduced by the ten or twelve thousandths of an inch required to remove the irregularities and make them round and smooth, but work having several diameters is produced with almost equal facility, every piece being exactly like every other piece, being finished in a matter of seconds as regards grinding time, and to limits of accuracy comparing favorably with other grinding methods.

The machine is a development of the "bar" type which has become widely known in association with the name of Bryant for internal grinding machines, but the usual principle has been reversed; the bar carries the work and the wheel is mounted upon the bed in a stationary position. Though the wheel may be adjusted with respect to its distance from the work-centers, this adjustment is not used for the feed. The wheel-head, when once set for the work in hand, has no further movement until wheel wear makes it necessary to reset it. The movement of the work toward the wheel, the feed movement, is obtained by swinging the work-carrier, which is suspended from the bar, just as in the regular Bryant machine the wheel-spindle is swung to and from the work.

With the wheel-head clamped in position the wheel-spindle has a firm support directly upon the base of the machine, thereby eliminating the vibration that might result under heavy cuts from having a free-moving slide at this point, and also a chance of error due to displacement possible with any movable member. A wheel 10 in. wide is used, having a diameter of 20 in. This wheel has a $12\frac{1}{2}$-in. hole and is supported by a cup-shaped wheel center that allows the main bearing to extend nearly to the central plane of the wheel.

The main bearing runs upon a double row of balls $1\frac{1}{4}$ in. in diameter. The outer end of the wheel-spindle is supported by a sleeve bearing of bronze having a tapered outer surface and provided with ring nuts for the purpose of taking up wear. This bearing is $3\frac{1}{2}$ in. in diameter and 7 in. long.

The belt pulley is independently mounted upon ball bearings and drives the spindle through an ingenious equalizing device that allows none of the strain of the driving belt, nor any vibration that might be caused by it, to be transmitted to the spindle. A section through the bearing and pulley is shown in Fig. 1, and photographs of the components of the equalizing device in Figs. 2 and 3. The driving pin *A*, shown in these two latter figures, passes through the larger hole in the spindle at right angles to its axis and is held loosely in place by the smaller pin *B*. The small hole in the spindle, at right angles to the larger one and through

which the smaller pin passes, is elongated to allow the driving pin to roll upon its own axis though held against endwise movement.

Flats are milled upon opposite ends of the driving pin *A* to bear against the faces *C* of the driver, which latter part is integral with the pulley shaft. These flats upon the driving pin are not exactly 180 deg. apart with respect to the axis of the pin, thus the faces *C* do not get quite a full bearing upon both of the flats at the same time. Therefore, as the pin is free to turn in the hole through which it passes, pressure of one of the faces *C* against the corresponding flat would tend to produce a turning movement of the pin about its own axis in the effort to establish a full bearing, but such a turning movement is opposed by the other face *C* tending, by reason of its slight angularity, to turn the pin in the opposite direction. Because of this condition, the pin is always in equilibrium between the two opposed forces and the driving power is thus equalized between the ends of the pin. Any shock or jar to the pulley caused by the belt is, therefore, absorbed by the device instead of being transmitted to the wheel spindle. Fig. 4 is a partial view from the rear of the machine and shows more clearly the construction of the wheel-slide.

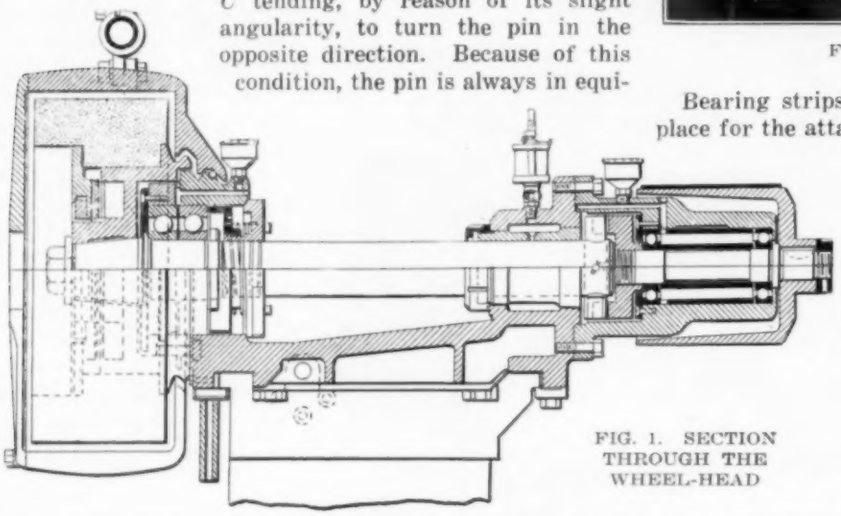


FIG. 1. SECTION THROUGH THE WHEEL-HEAD

FIG. 2. PARTS OF THE EQUALIZER DRIVE

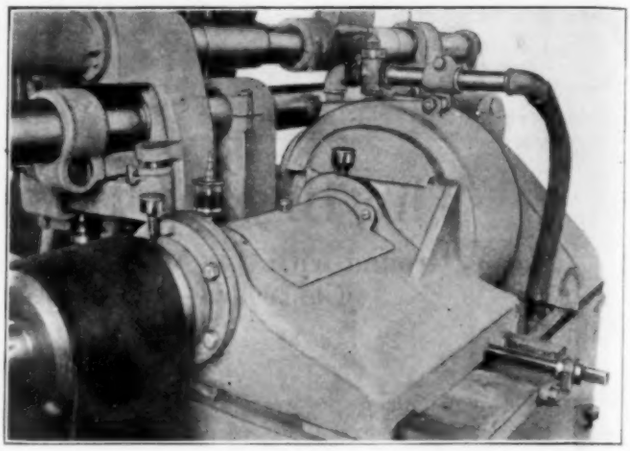


FIG. 4. THE WHEEL-HEAD

Bearing strips upon the back of the base provide a place for the attachment of the 15 hp. motor that drives the machine. An endless belt 8 in. wide passes over two idlers, shown in Fig. 5, to the pulley on the wheel-head. The lower pulley, however, is more than an idler, as it is keyed to a shaft which passes through the base of the machine and from which power for all auxiliary movements is obtained. The upper idler is weighted to maintain an even belt tension and to compensate for adjustment of the wheel-slide. Both idlers run upon ball bearings and, as neither they nor the pulley upon the spindle have outboard bearings, the belt, though endless, may be taken off or put on at will.

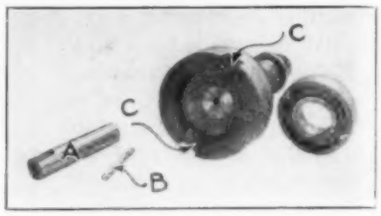



FIG. 3. PARTLY ASSEMBLED DRIVE

The drive to the work-head is first through the horizontal belt and a pair of 3-step cone pulleys seen in a Fig. 6, and then through the vertical belt to the drum pulley on the end of the spindle drive shaft. The lower belt and cones provide for changes of rotative speed. The inner horizontal belt, to be seen at the same place, drives the circulating pump. The vertical belt hangs loosely from the drum and is tightened by means of a swinging idler operated by means of a conveniently placed lever, thus furnishing the means of stopping and starting the work. The starting lever is also connected with a brake shoe bearing upon the drum, so that when the idler is drawn out of engagement the brake is simultaneously applied.

The drive shaft to which the drum is keyed is not the work spindle, but terminates at its inner end in a helical toothed pinion meshing with an internal gear upon the back of the drive plate. The helical gears minimize the tendency to produce "gear marks" upon the work, sometimes resulting from the use of parallel toothed gearing.

In Fig. 5 the various movements of the machine may be traced. The work centers are carried in the frame *AA* suspended from the main bar *B*, which latter is the

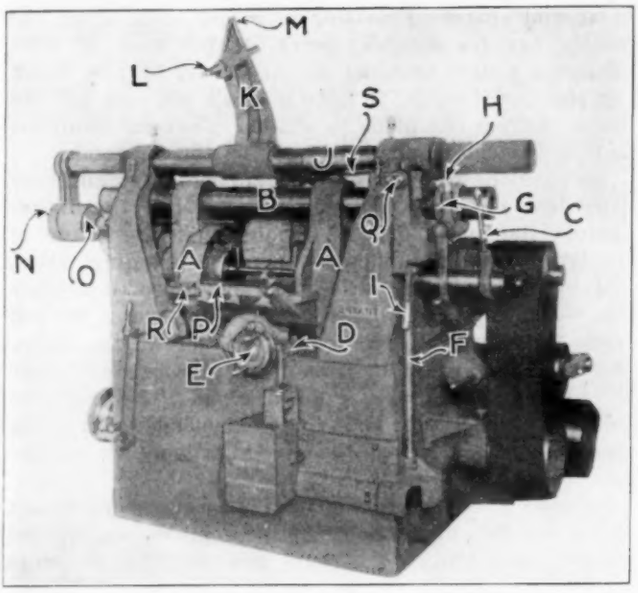



FIG. 5. FRONT OF MACHINE; OPERATOR'S POSITION

feature that gives to the Bryant type of machine its name. The center at the driving end does not revolve, nor has it any adjustment endwise, except as the whole frame is moved. The rear spindle, which is a sleeve, may be adjusted longitudinally for a distance of 12 in. to accommodate various lengths of work and, in whatever, position it may be, is firmly clamped to the lower member of the frame *AA*, the latter corresponding to the cross-slide of other types of machine.

An inner spindle, carrying the tail spindle, has a limited movement endwise for the purpose of mounting and demounting the work. This movement is controlled by the lever *C* through a spring-supported cam that holds the tail center strongly in place, while still allowing it to recede as the work expands under the influence of the heat generated by the grinding operation.

The bar *B* slides, and also turns, in adjustable bearings supported by the frame of the machine. Telescoping sleeves upon the bar protect the bearings from dirt and particles of abrasive. Endwise movement of the bar, of course, causes a traversing movement of the work across the face of the wheel, and the swinging movement provides for feeding the work to the wheel.

The bracket *D* is permanently fastened to the base of the machine and carries the cross-feed screw and sizing mechanism. The inner end of the cross-feed screw carries a hardened bearing shoe, upon which rides a bearing bar fastened to the carriage and held at all times in contact with the shoe by heavy counterweights. A pawl engaging with the ratchet *E* automatically turns the latter forward until it is disengaged by a shield that partly covers the ratchet wheel. A graduated dial enables the operator to set the shield to disengage the pawl at any predetermined point.

The machine is semi-automatic in its operation in so far as, after the work has been ground to a specified diameter, the wheel is automatically withdrawn from the cutting position. This action insures a very close duplication of size, as the grinding time of the wheel, after it has reached a positive stop, is exactly the same on every finished piece. That is to say, the length of time that the wheel is allowed to grind after reaching a positive stop for a set diameter is the same for each piece ground.

Traversing movement is transmitted to the bar *B* by means of an eccentric near the upper end of a vertical shaft, to be seen at *F*. The eccentric straps are connected to the clamping collar *G*, which may be tightened upon the bar by a movement of the operator's crank-wrench upon the head of the clamping screw *H*. The squared projection upon which the crank-wrench is shown in the picture is the end of a pinion shaft by means of which the operator may move the main bar by hand in either direction to any desired position, first loosening the clamping collar *G*. All wrench-operated parts of the machine are fitted by the one crank-wrench.

The limit of the power traverse movement is ½ in. and can be changed only by changing the eccentric, which change is not contemplated as part of the regular adjustments. It can, however, be put out of action at any time by lifting the lever *I*, which thus disengages a clutch on the vertical shaft. If a piece of work is of a single diameter, or if it is of several diameters and each shoulder is sufficiently relieved at the corner, the power traverse is used. If all or any part of the piece to be ground is a taper or curve, traversing is, of course, out of the question.

The upper bar *J* of the machine may be rotated or moved endwise the same as the main bar. It has the same kind of bearings and is protected from abrasive in a similar manner. This bar carries a bracket *K* in which a diamond holder *L* is set, and opposite to the diamond and at the extreme end of the bracket is a hardened bearing stud *M*. Counterweights *N* and *O* on the outer end of the bar assist the operator in controlling its movements. The outer weight is keyed to the bar and balances the diamond-carrying bracket in all positions; the inner weight turns freely on the bar until the diamond is lowered nearly to position for dressing the wheel, when a lug engages and lifts it, so that further movement of the diamond toward the wheel is resisted by the weight.

Fastened to the front of the carriage at *P* and held thereto by the three large hand-operated clamping screws to be seen under the carriage is a bar about 12 in. long, the inner profile of which is an exact replica of that of the piece to be ground. This piece is called the master-bar and is produced by toolroom methods, for upon its accuracy depends the accuracy of the product. The machine has no control over *relative* diameters. Actual diameter of the work as a whole is completely under control of the operator through the cross-feed screw and sizing mechanism, but, if one diameter upon a stepped piece is too large or too small in relation to other diameters upon the same piece, the fault is in the master-bar and must be corrected there.

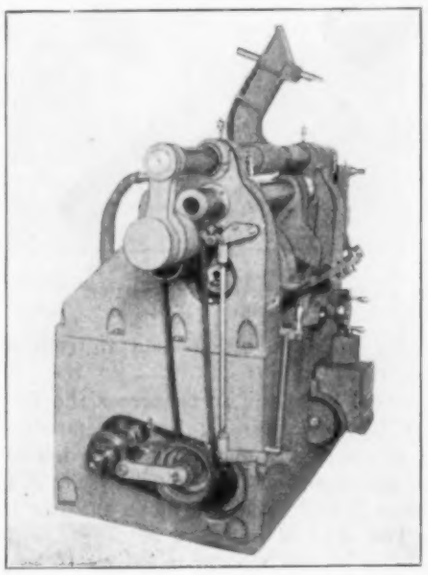


FIG. 6. END VIEW OF MACHINE

To form or to redress the grinding wheel, the carriage is locked against endwise movement by tightening the clamping screw *H*, with the power traverse clutch out of engagement. The diamond-carrying bracket is then swung down and the upper bar *J* moved endwise by means of the operator's crank-wrench placed upon the pinion shaft *Q*, until the stud *M* passes back of the

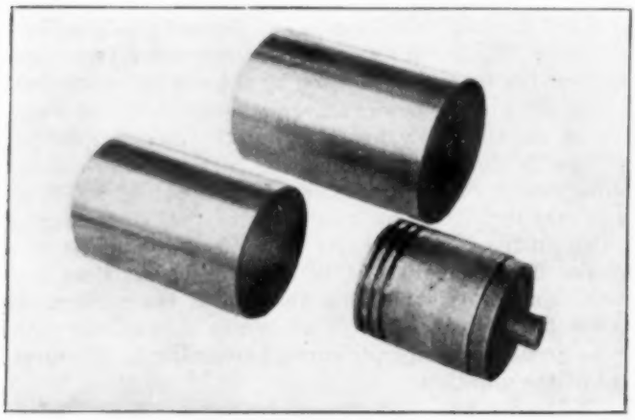


Fig. 7.

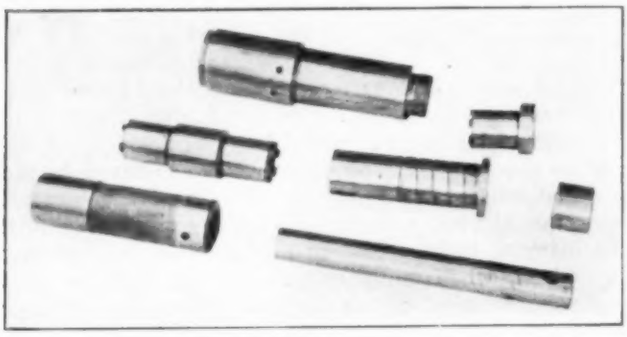


Fig. 8.

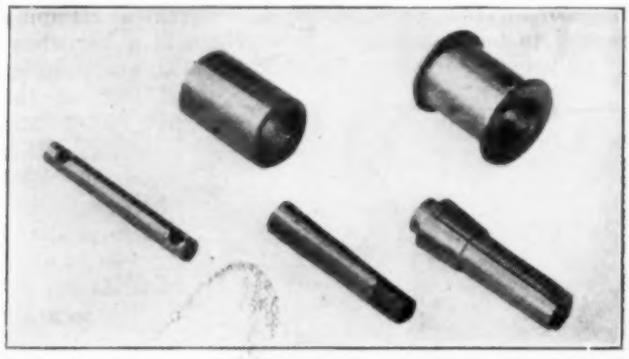


Fig. 9.
SAMPLES OF WORK GROUND ON MACHINE

master-bar and bears upon it, being held in contact therewith by the counterweight *O*.

The diamond is passed back and forth across the face of the wheel either by power or by hand, depending somewhat upon the shape of the master-bar. A double-end clutch upon the upper end of the vertical shaft *F* is controlled by the lever *S* and serves to move the bar in either direction. The stud *M* will not, of course, ride over a square shoulder on the master-bar, and if such shoulders must be produced on the work the diamond would have to be traversed by hand and the bracket lifted over the shoulders.

The standard master bar is cylindrical in shape, making it easy for the user to replace and to provide bars of special shape. Provision is made, when using the master bar for shoulder work, as the stud *M* rides against a square shoulder on the master bar, by rotating the bar slightly, to have a small pin cam lift the diamond from one plane to another. Several shoulders in this way can be operated upon by the diamond.

Because the position of the diamond is at all times dependent upon the position of the stud that bears against the master-bar, it follows that the shape of the latter will be duplicated upon the grinding wheel, and by the grinding wheel will be reproduced upon the work. As the whole carriage is swung to and from the wheel by the cross-feed screw, the latter determines the amount of material to be removed from the wheel by the diamond at each pass; therefore the diamond need never be forced beyond its cutting capacity by reason of the irregular contour of the master bar.

Samples of work ground on this machine are shown in Figs. 7, 8, and 9. Some of these pieces are parallel and of one diameter; others are of two or more diameters; and one, at least, has a tapered portion. All of the parts were ground by feeding straight on to a wheel of corresponding contour, and the grinding time was in some cases a matter of seconds.

The machine occupies a floor space of about 5 x 8 ft. and weighs 6,000 pounds.

## Heavy Sugar-Machinery Operations

BY FRANK A. STANLEY

In an article (page 441, Vol. 53) on foundry work at the plant of Dibert, Bancroft & Ross, New Orleans, La., illustrations were presented showing methods of molding big cone-shaped castings for vacuum pans. Reference was made in that article to the coring of over four hundred 3¼-in. holes in the conical walls of the castings for the reception of a series of copper tubes. One of the striking jobs in the machine shops of this firm is boring out these cored holes to size, an operation illustrated in Fig. 1.

The casting to be machined in this respect is of peculiar form and of unusual size for handling under standard tools. The method of getting at the work is well shown. A big radial drilling machine is employed for the operation and is provided with a special cradle with V blocks in which the cone-shaped casting is rested for each successive boring cut. The casting is 13 ft.

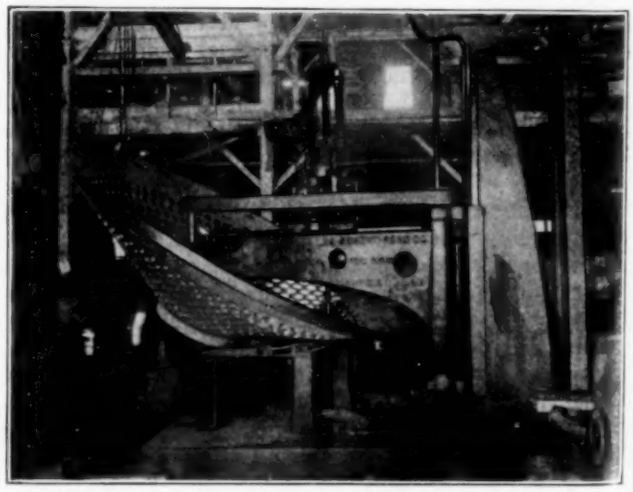


FIG. 1. BORING HOLES TO SIZE IN LARGE CONE-SHAPED CASTING

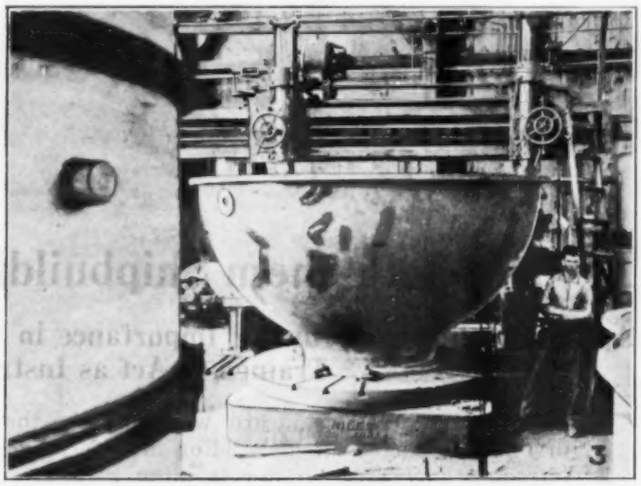
in diameter at the large end and nearly 6 ft. high. Its walls are about ½ in. thick. The holes are finished from the cored size by removing about ¼ in. of metal with the aid of a piloted boring bar and cutters. As each hole is bored out the weight of the casting is taken by the chain hoist at the outer edge and the shell rolled slightly to bring the next cored hole into position for boring. The coring of the casting is accurately done and the metal to be removed by boring is pretty evenly divided around the cut. This casting weighs 3,700 lb.

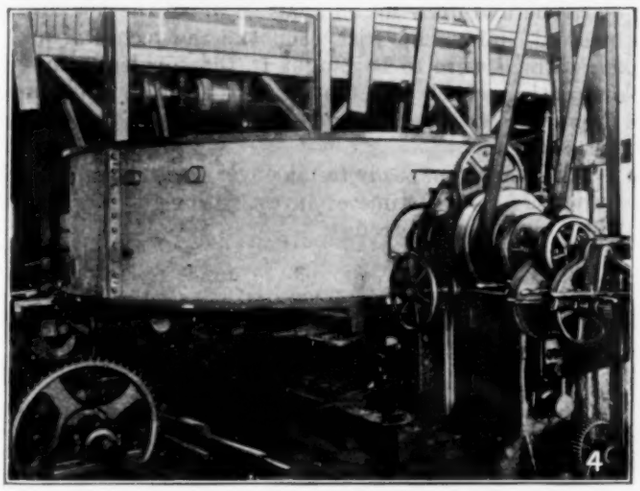
Fig. 2 illustrates drilling the flanges on big tank members. This operation is performed with the large radial drilling-machine arm run up to its highest position and with the head well out toward the end of the arm in order to clear the top of the work. As the height of the work is such as to make it impossible to swing the radial arm over the top, only one hole can be drilled in the head flange at each setting so the job is swung around to bring it into position for each hole.

Another piece of work which requires the utmost capacity of the machine tool is shown in Fig. 3. Here a dome for a big tank is seen on the table of a vertical boring mill where the flange-joint surface is being machined. The casting is 13 ft. in diameter and 6 ft. high. The crossrail of the boring mill is elevated to the top of the uprights and with the tools run up to the highest point in the heads there is just enough clearance to permit of the facing operation.

In Fig. 4 a cylindrical piece is shown on the horizontal boring machine. The work is over 15 ft. in diameter by about 4 ft. in height. Only one point of support is therefore possible on the table of the machine; the greater part of the cylinder is carried by auxiliary supports extending across the table and resting upon jacks under the extremities. The operation shown is boring a large hole through the side wall and facing the flange around the opening. Only the head of the machine is outside of the work.

A form planing job is shown in Fig. 5. The work is a scraper bar for cleaning sugar-mill rolls and its inner face is planed out to a concave surface as indicated by means of a connecting link at the top of the planer heads. The swivel of one head is loosened and the tool point is set from the center of the swivel the exact radius required for the concave form in the work. The saddle is clamped to the crossrail and the feeding of the tool to the cut is accomplished with the tool swinging through an arc, the radius of which is established as noted. This swinging of the toolhead is due to the connecting link at the top which is attached at the outer end to the top of the opposite planer head. The crossfeed for the latter head feeds its saddle along the rail in the usual fashion and the saddle for the working head being clamped fast, the top link simply translates the side movement of the one head into a swinging movement of the planing tool carried by the other head.



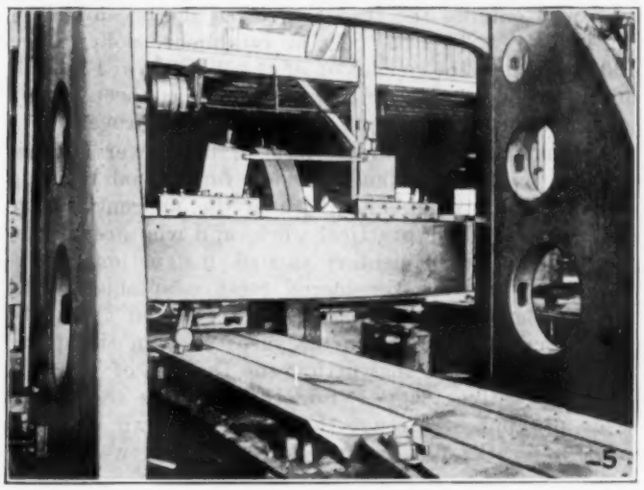
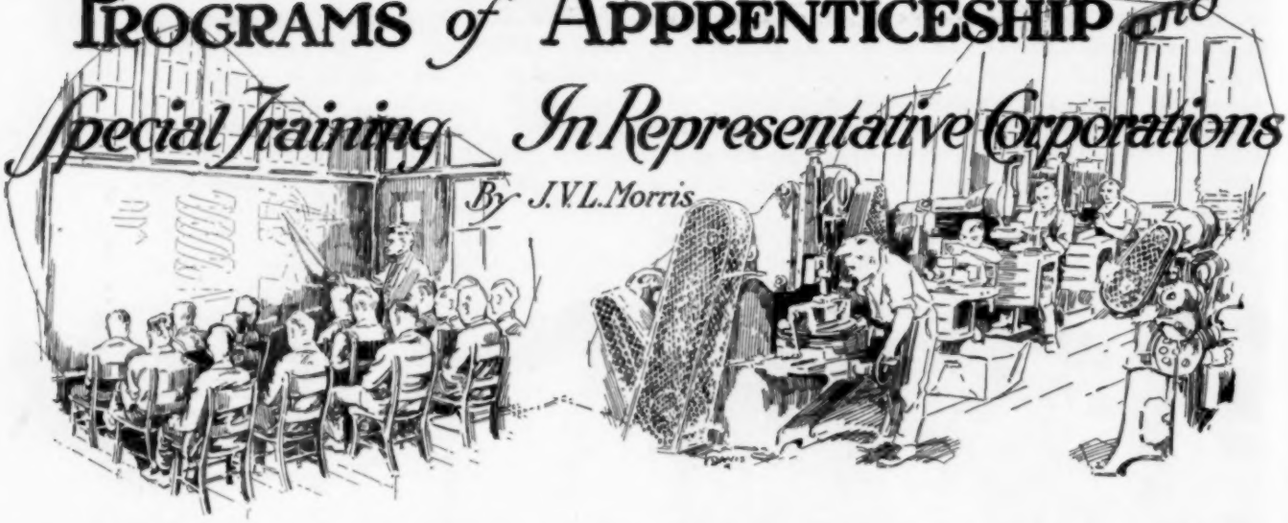




FIG. 2. DRILLING HOLES IN A TANK FLANGE. FIG. 3. A LARGE JOB ON A BORING MILL. FIG. 4. THIS CYLINDRICAL PIECE SURROUNDS ALL BUT THE HEAD OF THE HORIZONTAL BORING MACHINE. FIG. 5. A FORM PLANING JOB

# Programs of Apprenticeship and Special Training In Representative Corporations

By J. V. L. Morris



## X. The Bethlehem Shipbuilding Corporation, Quincy, Mass.

### Apprenticeship Is Assuming Importance in the Shipbuilding Industry—Sub-Foremen Are Trained to Act as Instructors for the New Men

THE FORE RIVER shipyard was probably the first plant engaged in shipbuilding in America to introduce apprenticeship for training its craftsmen who entered the trades involved in the shipbuilding industry. This has been an established policy since 1900, but since the conclusion of the World War the well-organized department of apprenticeship has been undergoing the process of being enlarged and improved.

The outstanding characteristic of the newer apprenticeship program is the provision for special training for the sub-foremen under whom the apprentices are employed for their practical work, and who are also to provide the supplementary school instruction. Sub-foremen who were considered most adaptable to the work of apprentice training were selected from the various crafts required in the yards and put through a rigorous course of instruction for the job of teaching their respective trades. For this purpose the supervisor of apprentices got them together two nights a week after the day's work, for about six weeks, and from four until nine o'clock they studied the problems of trade teaching, one of the classes being shown in Fig. 47. With the help of the supervisor each man reviewed his trade and drew up an analysis of all the operations involved, linking up with each one the technical problems which were to be taught in the supplementary or apprentice school. At the same time these instructor-foremen were given instruction in effective methods of teaching.

They were then ready to take over their classes, which were found at the time of investigation to embrace the following fourteen trades:

| | | | |
|---|---|---|---|
| 1. Blacksmiths | 6 | 8. Inside machinists | 70 |
| 2. Coppersmiths | 22 | 9. Boilermakers | 0 |
| 3. Electricians | 12 | 10. Outside machinists | 18 |
| 4. Shipwrights | 4 | 11. Shipfitters | 18 |
| 5. Joiners | 11 | 12. Mold-loftsmen | 32 |
| 6. Patternmakers | 14 | 13. Layer-outs | 12 |
| 7. Sheet-metal workers | 8 | 14. Draftsmen | 16 |
| | | Total | 243 |

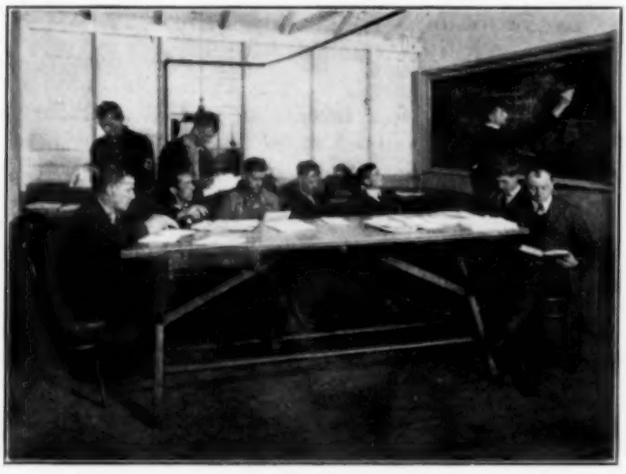


FIG. 47. INSTRUCTING SUB-FOREMEN WHO ARE TO TRAIN APPRENTICES

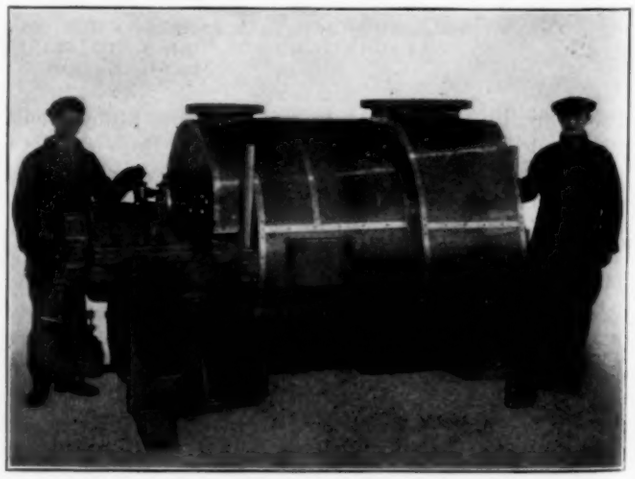


FIG. 49. TWO APPRENTICES AND A PRODUCT TURNED OUT BY THEM

The figures after each trade or craft mentioned represent the number of apprentices enrolled. It was stated that this is at an average ratio of 17½ apprentices to 100 first-class mechanics.

### The Apprentice System

One half day each week the apprentices are to meet with their instructors for the supplementary instruction. At this time the apprentice files a report, shown in Fig. 48, in the supervisor's office of the work upon which he has been engaged during the week. It will be noted that the report calls for entries as to whether the apprentice worked alone or with a mechanic, independent work being considered to his credit. In Fig. 49 can be seen a

S 5029

BETHLEHEM SHIPBUILDING CORPORATION, LTD.

FORE RIVER PLANT QUINCY WORKS

APPRENTICE WORK REPORT

FOR WEEK ENDING _____ 1920

NAME _____

DEPT. _____ NO. _____ YEAR _____

| | |
|---|---|
| MONDAY | |
| TUESDAY | |
| WEDNESDAY | |
| THURSDAY | |
| FRIDAY | |
| SATURDAY | |

GIVE NAME OF JOB, LOCATION, AND YOUR DUTIES.
MARK IN COLUMN AT RIGHT A LETTER FOR EACH DAY AS FOLLOWS:--

A- IF YOU WORKED ALONE.
B- IF YOU HELPED A FIRST CLASS MECHANIC.
C- IF YOU HELPED A SECOND CLASS MECHANIC.
D- IF YOU HELPED ANOTHER APPRENTICE.
E- IF YOU HELPED ANY OTHER PERSON.

SIGN HERE _____

FIG. 48. CARD ON WHICH APPRENTICE REPORTS WORK DONE

couple of apprentices with the product which they have assembled. When the plan is perfected, the report is to be entered on the individual cumulative record sheet of the apprentice, which sheet will show the progress in covering all the operations entering into the analysis of his trade. As this record is to show the quality of the work, as well as the operations involved, the supervisor will be able to obtain a constant rating on a man's progress.

It is planned to consider the record in determining the length of apprenticeship, so that by superior workmanship the apprentice will be able to shorten his period of service. The supplementary training is to consist of instruction in trade nomenclature, sketching, drafting, and the mathematics of the trade involved. The classes are in every case to be small, with never more than twelve assigned to each.

Apprenticeship in the plant conforms to the standard practice of admitting only boys over sixteen years of age and, while grammar-school graduation is desired, the completion of the sixth grade is required, together with the usual stipulations of sound health, average height, and good moral character. There is also a plan under consideration to shorten the period of apprenticeship as recognition either of graduation from an approved high school or of previous experience on the part of the apprentice.

The pay was stated to be at present at the following rates:

| | Cents per Hour |
|---|---|
| First year | 28 |
| Second year | 34 |
| Third year | 40 |
| Fourth year | 46 |

There is, however, a tentative plan under consideration to establish the pay of apprentices as proportional to that of the journeymen. Under this provision the rates would be determined upon the following basis:

| | |
|---|---|
| First six months | 35% of the first-class mechanics' wages |
| Second six months | 40% of the first-class mechanics' wages |
| Second year | 45% of the first-class mechanics' wages |
| Third year | 50% of the first-class mechanics' wages |

The latter system of payment, with an added item to provide for a fourth year, seems the more reasonable, as the earning power of an apprentice at any period of his contract is evidently to be determined equitably by the amount paid to journeymen for performing the same work. How much this journeyman's rate will be can not be known four years in advance. Because of dissatisfaction with the fixed rate, undoubtedly many apprentices failed to complete their periods of service during the frequent wage increases of the late war; and it is to be expected that there will be many readjustments because of the unsettled labor conditions apt to exist for the next few years before normal conditions of production are recovered.

### School for Draftsmen

It should be stated that the sixteen drafting apprentices mentioned in the summary of apprentices were promising individuals selected from the other crafts and given a four-month intensive training course previous to their transfer to another plant of the corporation. It is now planned to develop a regular drafting school under the direction of a skilled naval architect. The plan is to make a careful selection of apprentices, graduates of high schools being preferred, give them at least one year of practical experience in the shipbuilding crafts, and then two years of naval drafting under intensive training. Mathematics, mechanics, strength of materials and the various phases of ship design are to be given in classes held twice daily, one in the forenoon and the other in the afternoon. This action is now planned as an emergency measure to meet the present very serious shortage of draftsmen of all kinds, the shortage being particularly acute in the field of naval design on account of the sudden impetus given to shipbuilding in the United States.

Later, when the need has become less acute, it is planned to make the course somewhat more extended and to introduce a plan whereby the drafting students will be formed into pairs, alternating one week in the drafting room under the course outlined above and the following week at work at the various crafts about the plant so that the prospective draftsmen may become conversant with all phases of shipbuilding. This plan is a highly interesting development of the co-operative idea for training technical workers, in that the plant's

management will supply both the school and the shop practice, and it seems to promise nearly ideal conditions for learning this highly technical vocation.

Although the complete development of some phases of the apprentice training here outlined awaits the construction, now in progress, of the building necessary to satisfactorily house the supplementary schools, the programs have been described as fully as possible when in only partial operation. Other phases of special training have been projected and were in partial operation during the past winter. Among them should be mentioned foreman training and the teaching of English, with a comprehensive course in civic training for the alien employees.

# Handling Tools in Railroad Shops

## Toolrooms and Tool Cribs—Care and Repair of Tools—System of Inspection—Storing and Issuing—Grinding—Standardization of Shapes and Sizes

By J. V. HUNTER
Western Editor, *American Machinist*

MANY of our railroad shops no longer have the hit-or-miss sort of toolrooms that unfortunately still afflict some industrial plants. The toolrooms in the cases under observation are highly organized affairs, giving efficient and economical service. Tools are kept properly, regularly inspected for damage, put in good condition before reissuing and carefully checked in and out, and all haphazard handling has been eliminated. This condition contrasts strongly with another shop recently visited where at least one drilling-machine operator told the writer he needed more tool space, although it was observed that he had a table of three shelves and an extra cabinet full of drills, reamers and similar tools. That man was only one out of hundreds of machine operators in the shop, so the amount of money tied up in dead tools distributed throughout the establishment can only be guessed at.

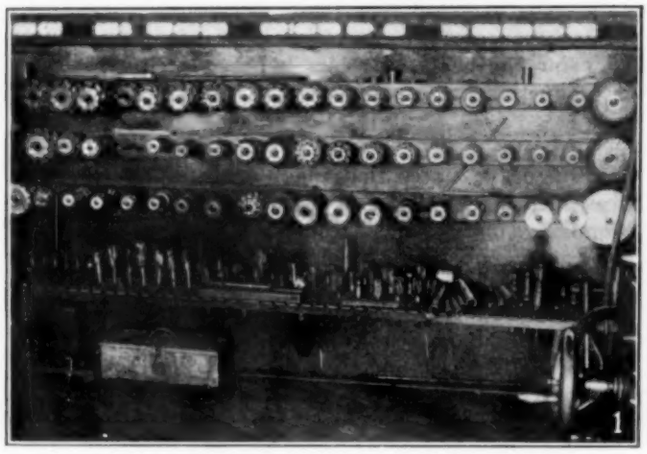


FIG. 1. MILLING CUTTER AND REAMER RACK IN A RAILROAD-SHOP TOOLROOM

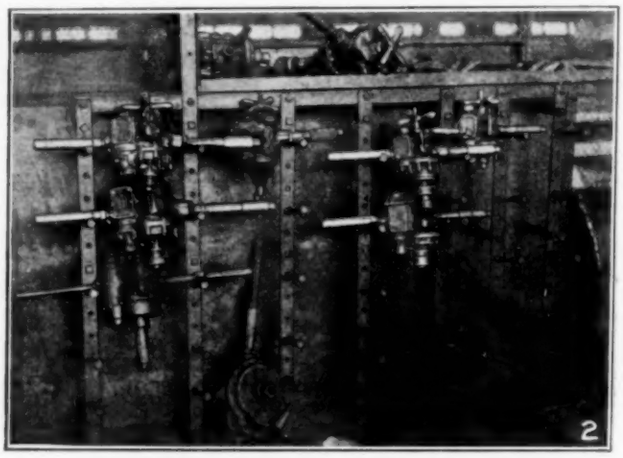


FIG. 2. STORAGE RACK FOR OVERHAULED AIR-MOTORS

At the shops of the Wabash Railway Co., Decatur, Ill., there are three tool cribs provided to serve the needs of the shop, and they are under the direction of the toolroom foreman. Two of the cribs are located so as to best serve the machine shops and erecting floor, the third serves the boiler shop.

Tool-storage method is the leading feature to be noted in these cribs as all tools are handled with great care, inspected and repaired or sharpened and then laid away in racks properly arranged so that they may be quickly found when wanted. The rack for special milling cutters and reamers, Fig. 1, is a model as all the tools are so placed that they are always readily accessible and cannot come into contact with one another to do damage to their cutting edges.

When air motors are brought to the toolroom for overhauling they are laid as received, on the shelf over the rack shown in Fig. 2. So soon as they are repaired they are laid on the pegs on the front of the rack. Each air motor has a number and a letter designating the tool crib to which it belongs and the attendant can call for these as they are made ready.

In the boiler shop, where a large number of air motors are employed, the tool crib is provided with the double rack shown in Fig. 3. The rack also provides for other parts, as will be noted, with the air hose connections below and shelves for chisels and punches above. The workman's check rack shows in the background.

Another section of steel shelving built into compartments, Fig. 4, is provided for the minor tools and wrenches. Its checkboard is located on the near end.

The proper attention is given to air hammers, and the special tank shown in Fig. 5 is provided for immersing them in oil as they are returned to the tool crib from the shop. After having been dipped in oil they are turned up to drain in the manner shown in the illustration. This insures that they are thoroughly lubricated and in a clean condition ready for re-use. The hammer shown in the background at *A* is one which has been provided with a supporting bracket made from a piece of pipe and is used for boiler-flue beading. When this hammer is in use the pipe bracket can be inserted in a flue adjacent to the

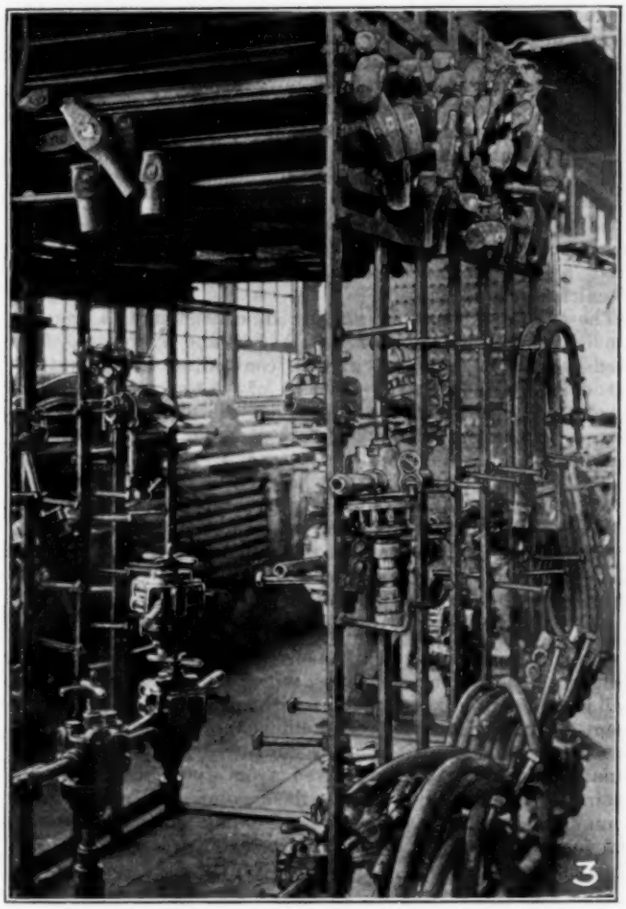


FIG. 3. RACK IN BOILER-SHOP TOOL CRIB FOR AIR MOTORS AND PARTS

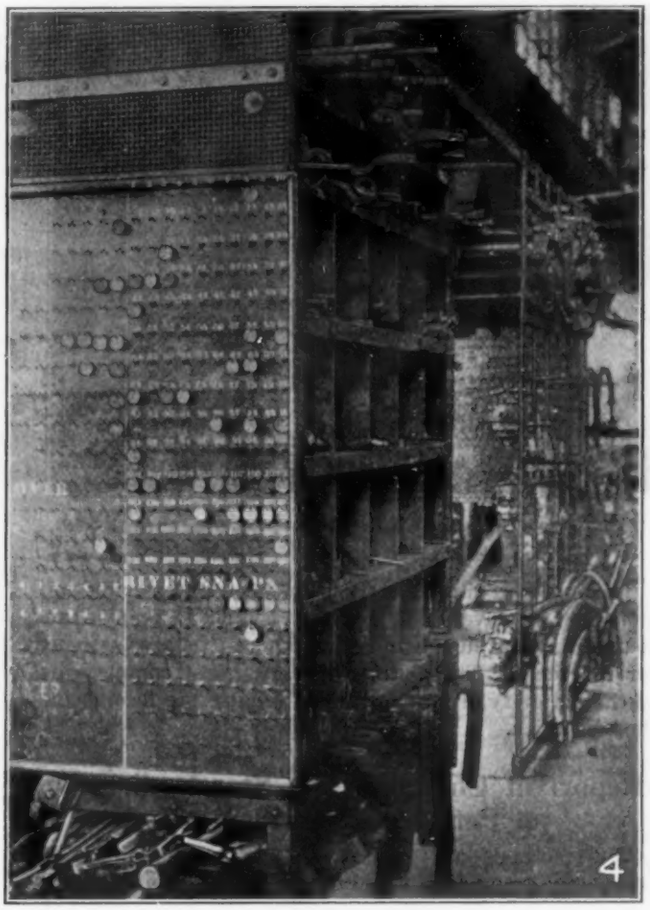


FIG. 4. STEEL SHELVING AND CHECK-BOARD IN BOILER-SHOP TOOL CRIB

one being beaded and takes a part of the weight of the tool off of the arm of the operator.

### The Chicago and Alton Toolroom

The mechanical department of the Chicago & Alton R.R. has made a decided showing for standardization of the lathe, planer and kindred tools in its Bloomington, Ill., locomotive shops. Tools are no longer ground in a haphazard fashion by the workman in the shop, but when dulled are returned to the toolroom, Fig. 6, for regrinding. Some of the grinding equipment is shown in the illustration.

The tool crib for issuing the tools to the shop is handled in a systematic manner and every size and variety of tool is properly stored away in compartments provided for the purpose, Fig. 7. The uprights of the toolrack are of T-section with angle-iron shelf brackets riveted to the inside leg. The shelves are straight sheets of $\frac{1}{16}$-in. black steel plate, and while the shelving has not been built to attain lightness it certainly is substantial and compact.

Dulled tools returned to the crib are laid aside by the attendant and in his spare time the accumulations are ground and returned to stock.

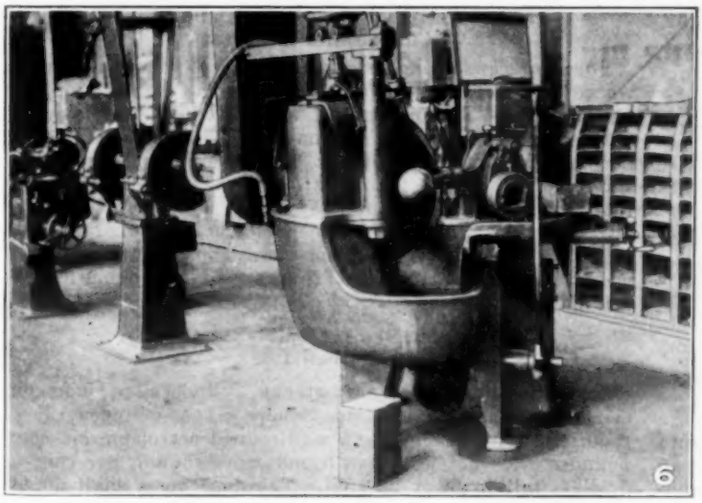


FIG. 6. TOOL GRINDING EQUIPMENT IN THE BLOOMINGTON SHOP

FIG. 7. TOOL CRIB FOR STANDARD MACHINE TOOLS

FIG. 5. OIL TANK FOR LUBRICATING AND DRAINING AIR HAMMERS

The stock of standard lathe, slotter and boring mill tools is well covered by a chart, which is framed and posted in a conspicuous position where it is always ready for reference. The chart gives an almost complete list of the majority of standard tools required in locomotive-shop practice.

## Report of Committee on Standardization of Petroleum Specifications

The methods of testing and the specifications for petroleum products adopted by the Committee on Standardization of Petroleum Specifications has been published in the report given in Bulletin No. 5, issued by the Department of the Interior, Bureau of Mines, Washington, D. C., and the specifications contained in it are effective from Dec. 29 last.

This bulletin supersedes Bulletins 1, 2, 3 and 4 of the Committee. All the specifications contained in these bulletins have been carefully studied and, where necessary, revised and co-ordinated. To these revised specifications have been added several which have not been previously published. Bulletin 5, therefore, gives a practically complete list of petroleum products used by the Government and its agencies, together with complete specifications for each product and full descriptions of the methods of testing employed in the Goverment laboratories. In general, the committee has adopted the methods recommended by the American Society for Testing Materials, as these methods agree with those used by Government agencies and also have the sanction of a number of petroleum trade associations. It is recognized, however, that the petroleum industry continually faces changes in the quality of crude oils available, and the committee therefore will welcome suggestions and criticisms.

The following specifications are given herewith because of their more immediate interest to our readers. It is stated in the report that all tests of these specifications shall be made according to the methods for testing lubricants adopted by the Committee on Standardization of Petroleum Specifications.

### Cup Grease

For the lubrication of such parts of motor equipment and other machinery as are lubricated by means of compression cups; Nos. ½ and 1 to be used in spindle cups or transmissions—The grease shall be a well-manufactured product, composed of a calcium soap made from high-grade animal or vegetable oils or fatty acids, and a highly refined mineral oil. The mineral oil used in reducing the soaps shall be a straight, well-refined mineral oil with a viscosity at 100 deg. F. of not less than 100 seconds.

No. ½ cup grease shall contain approximately 13 per cent of calcium soap.

No. 1 cup grease shall contain approximately 14 per of calcium soap.

No. 3 cup grease shall contain approximately 18 per cent cent of calcium soap.

No. 5 cup grease shall contain approximately 24 per cent of calcium soap.

These greases shall be similar in consistency to the approved trade standards for Nos. ½, 1, 3 and 5 greases. The grease shall be a boiled grease, containing not less than one or more than three per cent of water when finished. A clean copper plate shall not be discolored when submerged in the grease for 24 hours at room temperature.

No. ½ grease. Ash shall not be greater than 1.7 per cent.
No. 1 grease. Ash shall not be greater than 1.8 per cent.
No. 3 grease. Ash shall not be greater than 2.3 per cent.
No. 5 grease. Ash shall not be greater than 3.5 per cent.

The grease shall contain no fillers such as resin, resinous oils, soapstone, wax, talc, powdered mica or graphite, sulphur, clay, asbestos, or any filler.

### Transmission Lubricant

For the lubrication of transmission gears and bearings, differential gears, worm drives, winch drives, and roller and ball bearings used in connection with such parts of the equipment of motor vehicles—The lubricant shall be a refined petroleum product, without the addition of any vegetable or animal oils or products derived from them, and must be entirely free from fillers. The flash point shall not be lower than 460 deg. F. The viscosity at 210 deg. F. shall be within the following limits: 175 to 220 seconds.

### Marine-Engine Oil

For the lubrication of reciprocating steam engines in marine service where a compounded engine oil is required—This oil must not be used in circulating or forced feed systems. The oil shall be a compounded oil made from refined petroleum oil and 10 to 20 per cent of blown refined rapeseed or blown refined peanut oil, so compounded that it will not separate or break down in any way either before or while in service. The viscosity shall be: 65 to 75 seconds at 210 deg. F., not over 700 seconds at 100 deg. F. The pour test shall not be above 32 deg. F. The oil shall not contain more than 1.50 per cent of acid, calculated as oleic acid (equivalent to 3.0 mg. K. O. H. per gram of oil). A clean copper plate shall not be discolored when submerged in the oil for 24 hours at room temperature. The oil shall remain completely emulsified for an hour from an emulsion with (1) distilled water, (2) 1 per cent salt solution. The oil shall show a flow at the end of 14 days of at least 30 per cent of its flow at the end of the first 24-hour period.

### Mineral Steam Cylinder Oil for Non-Condensing Engines

For non-condensing steam-engine cylinder lubrication where a mineral oil is required; also as a stock oil for compounding—The oil shall be a well-refined petroleum oil without compounding of any nature. The flash point shall not be lower than 475 deg. F. The viscosity at 210 deg. F. shall be within the following: 135 to 165 seconds. The cold test shall not be above 45 deg. F. When 5 c.c. of the oil is mixed with 95 c.c. of petroleum ether and allowed to stand 24 hours, it shall not show a precipitate or sediment of more than 0.25 c.c. (5 per cent by volume of the original oil).

### Compound Steam Cylinder Oil for Non-Condensing Engines

For the lubrication of steam cylinders of non-condensing engines and pumps where a compounded oil is required. The oil shall be a well-refined petroleum oil, compounded with not less than 5, nor more than 7, per cent of acidless tallow oil or lard oil. The flash point shall not be lower than 475 deg. F. The viscocity at 210 deg. F. shall be

within the following: 120 to 150 seconds. The cold test shall not be above 45 deg. F. When 5 c.c. of the oil is mixed with 95 c.c. of petroleum ether and allowed to stand 24 hours, it shall not show a precipitate or sediment of more than 0.25 c.c. (5 per cent by volume of the original oil). The oil shall not contain more than 0.40 per cent of acid, calculated as oleic acid (equivalent to 0.80 mg. K. O. H. per gram of oil).

GEAR-CHAIN AND WIRE-ROPE LUBRICANT

For the lubrication and protection of chains, wire ropes and gears of cranes, dredges, steam shovels and all other heavy equipment; for the lubrication and protection of the gears and ropes of balloon hoists; and for swabbing the wires and cables of aircraft—the oil shall be a petroleum product only, free from vegetable or animal oils or products derived from them. It shall be entirely free from fillers, such as talc, resin, and all materials of every nature not related to the original product. The viscosity at 210 deg. F. shall be within the following limits: 900 to 1,100 seconds. When applied to a plate of polished steel the lubricant shall protect the steel for a period of thirty days when immersed in a 10 per cent salt solution.

LIBERTY, AERO AND MOTORCYCLE OIL

For the lubrication of stationary cylinder aircraft engines and motorcycles—The oil shall be made from pure, highly refined petroleum products and must be suitable in every way for the entire lubrication of stationary cylinder aircraft engines and motorcycle engines operating under all conditions. The oil shall not contain moisture, sulphonates, soap, resin, or tarry constituents which should indicate adulteration or lack of proper refining. These oils shall be supplied in two grades, to be known as Grade 1 and Grade 2. The flash point of the two grades shall not be lower than the following: Grade 1, 400 deg. F.; grade 2, 500 deg. F. The viscosity of the two grades at 210 deg. F. shall be within the following limits: Grade 1, summer, 90-100 seconds; grade 1, winter, 75-85 seconds; grade 2, 125-135 seconds. The pour test of grade 1 shall not be above the following limits: Summer, 45 deg. F.; winter, 15 deg. F. The cold test of grade 2 shall not be above 35 deg. F. Not more than 0.10 mg. of potassium hydroxide shall be required to neutralize one gram of grade 1 oil. The oil shall separate completely in one hour from an emulsion with distilled water at a temperature of 180 deg. F. The carbon residue on grade 1 shall not be over 1.5 per cent; on grade 2, not over 2.0 per cent. When 5 c.c. of the oil is mixed with 95 c.c. of petroleum ether, and allowed to stand 24 hours, it shall not show a precipitate or sediment of more than 0.25 c.c. (5 per cent by volume of the original oil).

TRANSFORMER OIL

For oil switches, oil circuit-breakers and transformers—The oil shall be made from pure, highly refined petroleum products, free from animal or vegetable oils or fats of any kind, and shall be suitable in every way for the purposes listed. The flash point shall not be lower than 290 deg. F. The viscosity at 100 deg. F. shall be within the following limits: 95-110 seconds. The pour test shall not be above 20 deg. F. Not more than 0.03 mg. of potassium hydroxide shall be required to neutralize one gram of the oil. The oil shall not show a deposit or any change other than a darkening of color when heated to 450 deg. F. A clean copper plate shall not be discolored when emerged in the oil for 24 hours at room temperature. The break down value shall not be less than 23,000 volts. The oil shall not contain more than 4.0 per cent of hydrocarbons soluble in concentrated sulphuric acid.

CAR OIL

As a lubricant on journals of ail cars, passenger coaches, steam and electric locomotives—Only refined petroleum oils, without the admixture of fatty oils or other compounds not derived from crude petroleum, will be considered. The flash point of this oil shall not be lower than 300 deg. F. The viscosity at 210 deg. F. shall be within the following limits: 65 to 75 seconds. The cold test shall not be above 32 deg. F. When 5 c.c. of the oil is mixed with 95 c.c. of petroleum ether and allowed to stand 24 hours, it shall not show a precipitate or sediment of more than 0.25 c.c. (5 per cent by volume of the original oil).

LOCOMOTIVE-ENGINE OIL

As a lubricant (by the Panama Canal) for all locomotives, running gears of all locomotive cranes, deck machinery of dredges (except engines) and for cold-saws in machine shops—Only refined petroleum oils, without the admixture of fatty oils or other compounds not derived from crude petroleum, will be considered. These specifications are identical with those of car oil (Panama Canal). The flash point of this oil shall not be lower than 300 deg. F. The viscosity at 210 deg. F. shall be within the following limits: 65 to 75 seconds. The cold test shall not be above 32 deg. F. When 5 c.c. of the oil is mixed with 95 c.c. of petroleum ether and allowed to stand 24 hours, it shall not show a precipitate or sediment of more than 0.25 c.c. (5 per cent by volume of the original oil).

CRANKPIN GREASE, DRIVING JOURNAL COMPOUND, ROD CUP GREASE

For the lubrication of driving journal on locomotives (provided with grease cellars) and for the lubrication of cranks and rods on locomotives (provided with grease cups)—The grease must be a well-manufactured product, suitable in every way for the purpose listed. It shall be composed of a soda soap (made from tallow) combined with a well-refined cylinder stock of petroleum oil. It shall be smooth, uniform and must not crumble under pressure. Driving journal compound shall be green or greenish in color. Rod cup grease and crankpin grease shall be slightly yellowish in color. The soap content shall not be less than the following: Driving journal compound 45 per cent, rod cup grease 40 per cent. Neither grade shall contain less than 0.50 per cent nor more than 2.5 per cent of free alkali, calculated as N.O.H. The total water, glycerine and impurities present shall not exceed one third the total dry soap content.

## Should Jigs and Fixtures Be "Designed"?

BY J. J. SIEFEN

Should jigs and fixtures be designed in the drafting room? The writer would answer in the affirmative. It reduces errors to a minimum and betters the product.

Minor parts can be made standard in quantities and used again when the jigs or fixtures become obsolete or partly worn out, as a record is available, and a low-priced man can look it up. A good many readers, no doubt, have been in contact with both systems as explained on page 26, Vol. 54, of the *American Machinist*, but a comparison of cost and efficiency which I made is very much in favor of designing in the drafting room. There is more teamwork, resulting in a better and cheaper product, since it is generally the combined ideas of several mechanical executives. Also less interference is caused as the drawings are checked and approved by different men. It requires less supervision, for even the best toolmakers and machinists will need advice when not working to blueprints, and the writer always found they expected and required it. We are slowly outgrowing the old-fashioned systems and are trying for standardization and specialization to reduce manufacturing costs.

It requires very little addition to the drafting force to design jigs or fixtures for quite a number of toolmakers or machinists. Standardization of machining operations and routing cannot be planned or executed efficiently when the shop does the designing, as each man wants to use his own system, feeling his way step by step. Where there is teamwork between the shop, drafting room and mechanical executives the shop always gets what it wants in jigs or fixtures, which are generally the very best obtainable.

# Metal Cutting Tools—IV*

By A. L. DeLEEUW

*(Continued from last week.)*

Uncertain as the beginning of a drilled hole is the end is still more so. If we imagine a drill of great length but of a material strong enough to transmit torsion from a spindle to the drill point, then this drill might be very flexible. If the drill point should strike a spot in the material which is somewhat harder or softer than the average material it would be deflected, in other words the axis of the hole will take a new direction. The flexibility of the drill will permit it to follow this new direction and even if that flexibility were not sufficient we still have to reckon with the looseness between the drill and the spindle, between the spindle and its bearing, with the flexibility of the spindle itself, and so forth. It has often been observed that in trying to drill a long hole, say through a spindle forging, the hole would not come out at the center of the far end, but somewhere away from that center, and sometimes even through the side of the forging. This latter case does not often happen, but neither is it an uncommon occurrence.

Locating the center of the far end of the hole is quite a difficult matter. Where bolt holes have to be drilled in flanges or castings, and where these holes have to match with holes in a flange of another casting, it is customary to start them at the surfaces where the castings must join. (See Fig. 66 where this matter is represented in exaggerated form.) Even if the material were entirely homogeneous and if the drill were ground entirely correct, there would be no assurance that the drilled hole would come out at the far end where it is wanted for the direction of the feed would not be exactly the desired direction of the axis of the hole. Little as this difference may be it becomes quite an important item when the hole is of considerable depth, say 5 ft. If for instance the drill spindle made an angle of 3 min. with the desired direction of the axis of the hole, and if the hole were 5 ft. deep, the center of the hole would be 1/20 in. away from its proper location at the far end. Such accuracy—only 3 min. variation—is not easily obtainable with a drill press. For that reason it is customary to revolve the work instead of the drill when drilling deep holes. This at least insures that the drill will have a tendency to follow in the proper direction if nothing interferes. The interfering items are: lack of homogeneity of the metal, incorrect grinding of the drill, looseness in the spindle, etc. Though this method is much better than revolving the drill and holding the work stationary it gives no absolute assurance of good results. In order to minimize the effect of heterogeneity of the metal, it is customary to drill with a very fine feed so as not to exert much pressure against the metal at any point, thereby reducing the amount of deflection of the drill point if it should strike a hard or soft spot. Of course this fine feed slows down the operation.

A much better method is to revolve both work and drill. If proper precautions are taken a hole will be produced which will come out at the proper point at the far end and which will be straight throughout its entire length. The only variation from a perfect hole will be that the far end of the hole may be of somewhat greater diameter than the size of the drill. For very deep hole drilling the piece to be drilled should be laid in a cradle supported from a fixture on the faceplate of a lathe at one end and in a steadyrest at the other end. The hole should be drilled half way through and then the piece with its cradle should be reversed in the lathe and the hole drilled from the other end. In this manner the axes of the two half holes will meet exactly but the holes themselves may be of somewhat different diameters where they meet. This is not objectionable if the hole has to be reamed out later on.

The reason why a straight axis of the hole is obtained when both work and drill revolve will be taken up more in detail under boring tools.

One precaution which should be taken when deep holes must be drilled with a twist drill is to make sure that the two lips of the drill cut equally. This may be done in the following manner: The drill should be held in the socket which can be centered on the spindle in the lathe. A small bar of soft metal should be held in the toolpost of the lathe, and should be placed in such relation to the drill that a small chip is taken by one lip of the drill when the drill is turned through half a revolution. If the other lip of the drill is correct or if it is too short the second lip will take no chip if the drill is turned through another half revolution, but if the second lip is too long it would take a chip. If we find that no chip is taken we know that the lip is either correct or too short as compared with the first lip. To find out which of these two is the case we advance the toolpost a very small amount, say 0.001 in., enough to let the second lip take a small chip. We now turn the drill through another half revolution and if the first lip takes no chip the drill is correct because we have already found that the second lip is not longer than the first one, and now we find that the first lip is not longer than the second one. When the two lips of the drill cut evenly and are ground to the same angles there will be very little tendency for the drill to deflect.

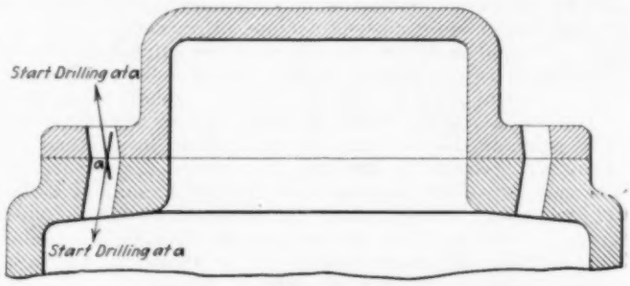



FIG. 66

FIG. 66. DRILLED HOLES IN MATING PARTS

A coolant is often used to assist in drilling. A later chapter deals with the general features of the using of coolant but in drilling operations the coolant has often a function to perform of an entirely different nature. Although as a rule coolants are commonly used under low pressure, drilling operations often require the coolant to be used under heavy pressure. As was mentioned before there is danger in automatic machines of the chip wrapping itself so tightly around the drill as to cause trouble, and therefore the drills are often modified in shape for the purpose of breaking up the chip, but even then the finely broken-up chips are apt to remain in the

*For the author's forthcoming book. All rights reserved.

grooves of the drills unless some means is provided to eject them. This ejecting of the fine chips is generally done by means of the coolant, whether this be oil, water, or some cutting compound. In some shops where considerable deep hole drilling has to be done, one will find permanent installations of hydraulic pumps, piping, drain tanks or cellars and filters. In other shops, for instance in rifle shops, the deep hole drilling machines are provided with their own little hydraulic installations consisting of a geared pump capable of delivering oil at a high pressure and the necessary piping, etc. We are not concerned here with these installations but rather with the means by which the fluid can be brought to the point of the drill. In some cases grooves are milled on the outside of the drill body and small copper pipes are laid in these grooves and fastened by means of soldering or some other method. Sometimes these pipes terminate below the shank and are provided with unions to connect them to the flexible pipe line. In other cases the holes terminate at the end of the drill shank so that the oil can be brought to the drill through the spindle or chuck holding it. These methods are quite satisfactory for relatively small holes when the chip is properly broken

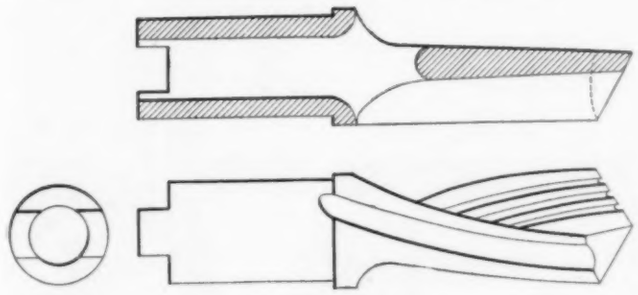


FIG. 67. AN OIL DRILL

up into small pieces and when it is not objectionable to have the oil and chips flow out through the grooves of the drill. Drills of this kind are quite frequently used in automatic machinery such as screw machines or on chucking lathes. However, they do not lend themselves to very high pressures or to large amounts of liquid. Where very deep holes have to be drilled it is better to use the oil drill shown in Fig. 67. This drill has a hollow shank and the grooves of the drill terminate in this shank. The oil is introduced around that portion of the outside of the drill which is milled to a smaller diameter than the land permitting a large volume of oil to flow toward the point. The chips are forced by the oil through the groove and into the center of the shank. The drill itself is connected to a hollow bar which is held in a device—a carriage or moving tailstock of a lathe—so that the oil and chips can flow out through the rear end of the bar. When the chips are formed they will gradually crowd into the grooves of the drill and finally choke up the openings leading to the pipe, or if they are already in the pipe they will collect there and choke the pipe itself. However, the oil is forced in under a sufficient pressure to eject these balls of chips. When drilling of this nature is done there is a continuous flow of oil coming out of the rear end of the pipe but without any chips, then suddenly a large mass of chips will be ejected and the flow will be free once more.

All that has been said about the construction and grinding of twist drills can also be said about the straight fluted drills, the only difference being that the flutes are not made in a spiral but in an axial direction. As a result straight fluted drills have no rake and are therefore particularly adapted for work in softer metals. A twist drill taking a fairly heavy chip is liable to pull itself into the work as it may be harder work to bend the chip than to penetrate further into the metal. If this happens the drill is apt to penetrate so far into the work that it will be twisted off. Of course this may be overcome by a special grinding of the twist drill so as to reduce the rake, but where a great deal of drilling in soft bross or copper or similar materials has to be done it is better to use a straight fluted drill. Special grinding of the lips of a twist drill must be done by hand, and as a result there is much danger that one lip would extend beyond the other which would cause it to take a much heavier chip. Straight fluted drills on the other hand can be properly ground by machine. It should be remarked, however, that a straight fluted drill requires much more power to remove the same amount of metal than a twist drill so that there is more danger of breaking. Large establishments which have to do much drilling in the softer metals should provide themselves with twist drills of greater lead. In that way they will have the advantage of as much rake as it is possible to use and consequently there will be much less danger of breakage of drills.

The requirements of gun barrel drilling are in a class by themselves. The barrel to be drilled has a length many times the diameter; very little metal is left for finishing on the outside, and the subsequent operations will remove very little metal from the bore, so that the hole must be practically correct after the first operation, drilling. It is not possible to drill from both ends because the two half holes would probably be out of line much more than the amount of finish left for reaming, so that it will be necessary to drill the entire length of the barrel in one setting.

The barrel is rotated and the drill held stationary. The drill is cylindrical in shape with a groove which removes about one-third of the metal of the cylinder. An oil tube in the drill body brings lubricant to the point and the chips are removed through the groove. The one lip goes to the center of the hole and terminates at a sharp angle, so that very little crushing of metal needs to be done. Therefore the pressure against the drill will be small. A very fine feed, only a fraction of one thousandth of an inch per revolution is taken, which still further reduces the pressure against the drill and its consequent tendency to deflect. Under those conditions the drill is guided in the hole by the fact that the body of the drill is the same diameter as the hole, in other words there is no clearance between the body of the drill and the hole.

The one lip drill serves its purpose of drilling small holes in long work very well but would be unproductive for ordinary drilling operations.

As one of the chief difficulties in deep hole drilling is the removal of chips, the most logical way to overcome it would be to have the work suspended from a vertical spindle so that the chips *fall* out. In machines of this kind the work revolves, the drill is stationary and either the drill or the work feeds. The first machines of this kind built were intended for very small work and were, to the best of the writer's knowledge, brought out by the Pratt & Whitney Co., but their manufacture has been discontinued. Recently drills of this type of much larger size have been brought out as a result of the requirements of the late war.

# Some Sheet Metal Body Work

## Operations Involved in Making Metal Bodies for Ford Cars — Blanking, Forming and Finishing the Sheets

SPECIAL CORRESPONDENCE

THE making of sheet-metal bodies for automobiles involves the use of large presses, not so much on account of the heavy nature of the work as of the large sizes of sheets which are necessary in the production of certain parts. In making the cowl for a Ford car, the sheet is first trimmed to the shape shown in Fig. 1; these sheets then go into the large press shown in Fig. 2, the sheet being firmly clasped between the plunger *A* and a corresponding member in the upper part of the die. These members hold the sheet firmly while it is carried down into the forming die and, before it assumes its final form, the friction ridges *B* and *C* come in contact with the outer edges of the sheet.

The sheet as it comes from the dies, is shown in Fig. 3, the central portion being largely cut away as well as the outer edges being trimmed in later operations. It will be noted that there are two depressions, *A* and *B*, made by punches in the central plunger, which help to hold the sheet firmly against all side motion during the forming operation.

The forming of the back sheet of the Ford coupelet is shown in Fig. 4, the sheet having been previously punched for the rear window. The window opening fits over the block shown in the center and the descent of the ram forms the sheet as shown in Fig. 5. This operation as will be seen, folds in the edge around the window at the back and also forms a stiffening bead along the front edge. In both Figs. 4 and 5, it will be noted that hooks are provided on the upper member and pins on the lower member, so that both parts can be held together when it is desired to do so.

A good idea of the way in which various sheets are finished is shown in Fig. 6. The sheets forming the back of the body are laid over the form shown, and any slight irregularities in the surface, such as produced by the tendency of the sheet to wrinkle, are taken out by the use of what is sometimes known as a milling file. In other words, a file with circular cut teeth instead of points as in the common file. It only requires the removal of a small amount of metal to take out most of the imperfections and by the aid of abrasive cloth on properly shaped, wooden blocks, the surface is easily restored to a good finish.

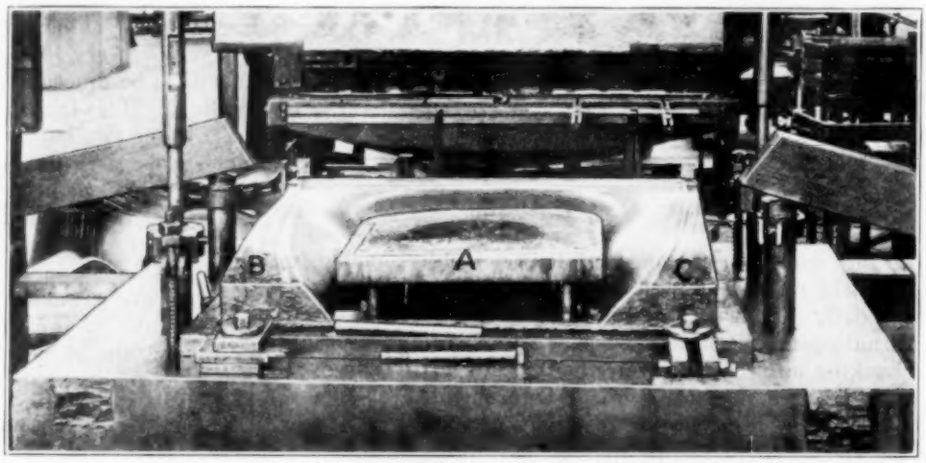



FIG. 2. THE COWL FORMING DIE

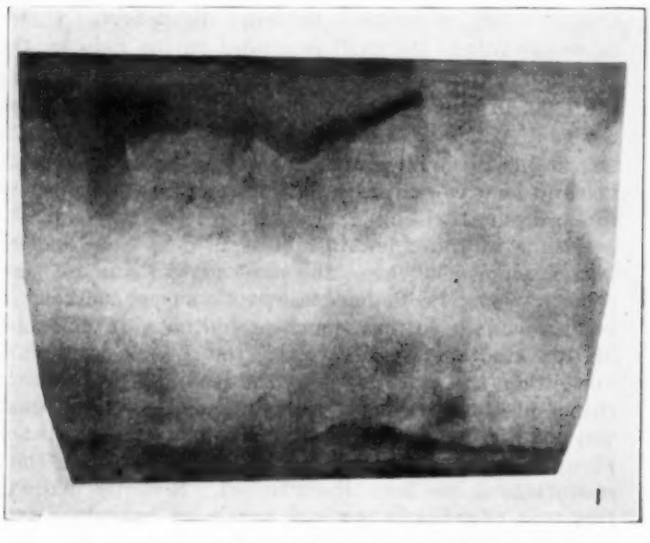



FIG. 1. BLANK FOR A FORD COWL

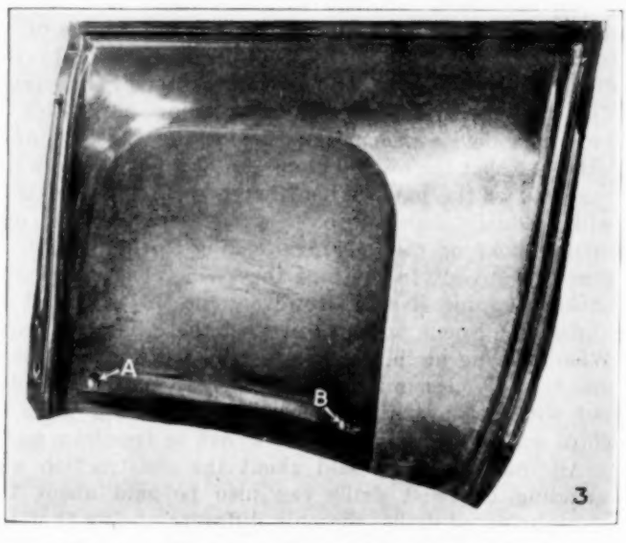



FIG. 3. A COWL AS IT COMES FROM THE DIE

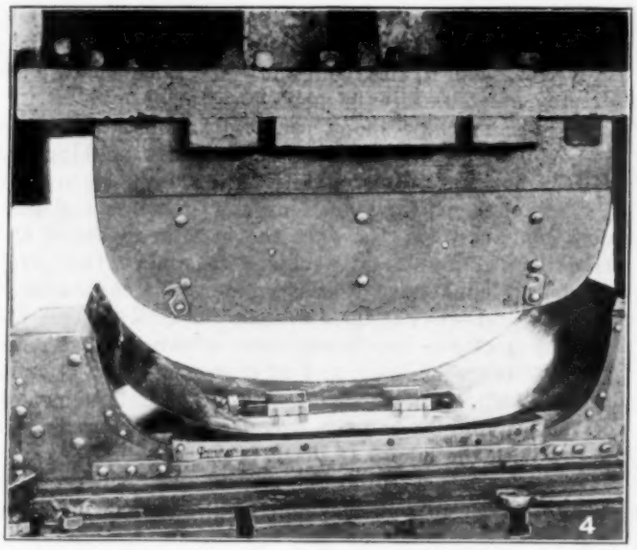


FIG. 4. FORMING THE COUPELET BACK

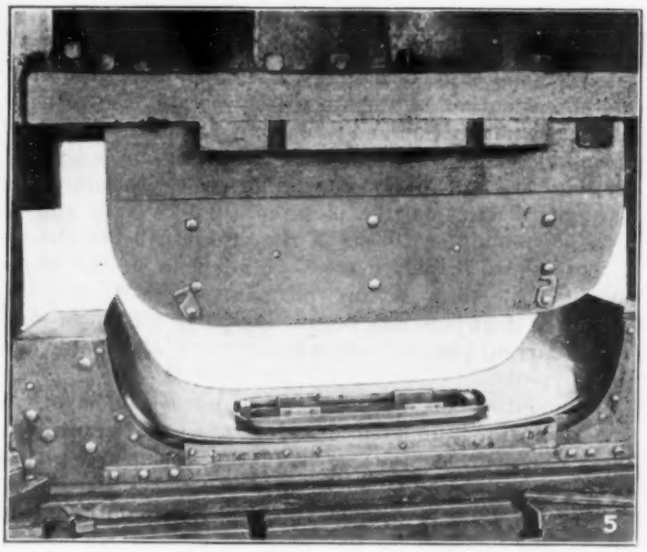


FIG. 5. AFTER THE FORMING OPERATION

FIG. 6. WHERE THE PARTS ARE FINISHED READY FOR PAINTING

This view also shows at the left how the finished cowls are handled; the fender-sides or wings, are treated in the same manner. Previous to this, the bumping hammer has been used where necessary, as shown in a previous article in connection with the making of fenders. This work depends largely upon the skill of the individual operator and men become very proficient in producing body parts with remarkably smooth surfaces so as to be readily finished in the usual manner.

## Movie Records of Machinery

By Lyne S. Metcalfe

In no industry have the new moving picture processes been so valuable as in the machinery and tool industry. These new processes consist of the animated technical drawing, the phantom drawing, the slow motion process of cinematography, the microscopic attachment to the movie camera, films in natural colors, and the new X-ray process.

It is in the animated technical drawings that machinists find the greatest utility, since they will reveal the ordinary unseen parts of intricate machinery in cross section and in motion. In the instruction of workmen, the animated drawings are doing much toward the saving of time and the maintenance of efficiency. A leading manufacturer of electrical machinery has just finished production on eight reels of technical drawings to be used in the instruction of workmen and salesmen. The Burroughs Adding Machine Co. has just completed a picture showing the inside workings of the calculator which may be run off in fifteen minutes time.

It is possible to project on the screen a moving picture of a machine complete, followed by sectional views of its parts. This gives the audience a clear idea of the relationship of the part to the whole, at which point a phantom drawing appears. All but the part then slowly

fades out; this turns into a cross section drawing, revealing the interior workings in detail. Notes amplify the pictorial explanation, in connection with a pointer, calling attention to the important point. The part is then shown in motion and when fully explained the whole machine reappears on the screen and again fades out, leaving a second portion for similar visualization. Thus the entire unit may be pictured, step by step and in life-like motion, with the X-ray effect. At the end, it is possible to display a cross-section view of the whole machine at once, setting all parts in motion. The animated drawings also permit the picturization of electrical current passing over a given route, also water and air currents.

Pneumatic tools used in steel construction have lent themselves to animated drawing processes admirably. This was done for the benefit of the workmen who use them, as well as for the mechanics who make the parts.

It is possible to demonstrate complicated machinery by moving pictures for the benefit of prospective buyers, saving their time and making clear the meritorious points more effectively than can be done by word of mouth or by means of the printed page. Not long ago the twist drill was the subject of an interesting movie that was widely shown before machinists in the East.

### Firms That Have Used "Movies"

One of the most valuable films ever produced in the tool industry was that circulated by the Henry Disston & Sons Co. of Philadelphia, which makes clear the manufacture of crucible steel, circular, band, cross cut and hand saws. This picture goes deeply into the process of saw manufacture under the most modern conditions. The scenes are not only of value to the mechanic, but also to the saw user.

The Russell Jennings Manufacturing Co., of Chester, Conn., has an interesting useful moving picture subject showing the manufacture of auger bits. The Sprague Canning Machinery Co., of Chicago, has filmed its canning machinery in action in a picture entitled, "Pea Canning in Wisconsin," and the United Shoe Machinery Co. has utilized the screen in three instances, having produced films which demonstrate the most intricate units in motion.

The larger toolmakers and special machinery builders are giving careful consideration to the possibilities of extending the use of the moving picture into the field of demonstration.

It is possible to "animate" drawings for new models in a manner that will give experts a more rapid understanding of the end it is sought to accomplish. Such drawings permit the showing of advance plans to prospective stockholders who perhaps could not easily grasp the ideas of the inventor in any other way. By using the moving picture, a number of investors might be assembled in one room at one sitting and witness a complete movie illustration of a piece of machinery, even before the model itself is made.

This was done in the case of an Eastern inventor who devised a new method of salvaging sunken ships in the Atlantic. He wished to get funds with which to build his boat and its necessary equipment; the idea was extremely complicated as it involved problems of marine engineering which the average man could not possibly grasp. Mere paper plans meant nothing and it was impossible to take the stockholders under the sea and show them how the idea might be expected to work out in practice. So he had made a full reel picture, showing in animated drawings the detailed operation of the boat and its equipment, with the result that in fifteen minutes every man in the room knew precisely what he was driving at and willingly made investment.

In most machine shops, each workman is called upon to perform only one function which goes to making complete a machinery unit. He seldom knows much about the complete machine itself or how it works and often does not know exactly what the man in the next aisle is doing. Foremen are coming to realize that every mechanic should have at least a general idea of the shop's product and what it does for the buyer. To this end, moving pictures are being used widely, shows being given at the noon hour, and all shop men given a chance to see them. The mechanic thus gets a broader idea of the machine he helps to produce and is more in sympathy with the labors of his neighbors.

One of the most interesting uses to which the movie screen has been put in connection with machine shop work was a production put on for the National Cash Register Co., entitled "Waste Can't Win." A large part of this picture was devoted to a moving picture "record" of the costly waste in machine tools, machines and raw materials in the big plant at Dayton. Several bushels of costly machine parts, tossed out of the window at stray dogs and cats by idle mechanics, were shown on the screen; the failure of employees to salvage waste metal and the wholesale misuse of costly tool parts, together with picture examples of the gross mistreatment of delicate machinery, was brought out clearly on the illuminated screen, in order that every employee might see himself as the foreman sees him—sooner or later.

Also in this production are pictured the results of careless machine assembly, what it costs in time, money and reputation for a careless assembly job to go through to the customer and that it must be shipped back over a slow and costly route to a high-priced assembler to be reassembled. The larger part of the NCR employees are skilled mechanics and though a good many thousands of dollars were spent on this picture, it was said after its first showing that it had paid for itself. The picture was by Jam Handy, who has found twenty-six different uses for films in business and industry and who has written similar productions for large American business organizations.

In teaching the use of costly tools—tools which require great skill to use—the moving picture undoubtedly will render the mechanic a great service. Besides teaching better, the picture teaches more quickly. Seventy per cent of the time ordinarily required was saved in teaching American soldiers by means of animated drawings of the Browning machine gun and the Springfield rifle in 1917, according to an official statement made by War Department officials who directed their use.

### "Movie" Catalogs

These movie records of machinery and tools may be edited more easily, from year to year, or, from month to month, than can a catalog. The master drawings are retained and may be filmed over, as models change, with very little extra cost. Film is practically nonperishable since reprints can be made of negatives every decade and, if kept waxed, the originals will last a generation. For that reason, the bigger concerns are producing all of their pictures with a definite plan in mind, that of maintaining a permanent moving picture record of the development of their units from year to year.

# What's So and What Isn't About Patents and Inventions

By EMANUEL SCHEYER

IT WAS in the summer of 1919, in the year following the signing of the armistice that I met a man who before the war had been a machinist. During the war he and some fellow machinists chipped in together and started a machine shop. They filled the technical requirements of one of the large government departments and obtained contracts which made them considerable money. He told me of some of his plans for investing his newly acquired riches, which included backing one of the men who formerly worked in his shop. This man had his head full of inventions and my acquaintance was seeing him through on some of them. One in particular he was enthusiastic about and it seemed good to me, despite the half-inch of callous I have acquired toward such things. And I still believe it is good, but not as a patent proposition, a distinction which will be clearer shortly.

HIS ROSY DREAM OF MILLIONS WITH ITS ACCOMPANIMENT OF LIMOUSINES AND SHADED LAWNS WAS FLICKERING

The invention was for a photographic means of making medallions, busts or statuettes. Instead of having made an ordinary photograph of your baby or wife it would be possible to have a bust made in stone or metal, any size being possible, or if you preferred, in the form of a cameo to wear on a ring. The reproduction would be as exact as a photograph and not very much more expensive. My friend had already spent considerable money in experiments and the construction of apparatus, besides paying the inventor a weekly salary and there was still much more work to be done. I annoyed him somewhat by asking the question, "But how do you know it is new?"

"I know it is," he answered. "I never heard of it before. Did you?"

"No," I replied. "But that doesn't prove anything. You have the whole world against you and have had for countless years; besides, while I am ready to confess that I am a very bright fellow, I don't know about anything that was done in the past. What I do know, though, is a pretty good way of finding out. Now I suppose you know that if this invention were known or patented by others or even described in any printed publication before you cannot obtain a valid patent. In such a case all this money you are spending will be for the benefit of the public at large, because anyone will be permitted to copy and compete with you. While this would be very philanthropical of you I don't believe you had it in mind when you started."

His rosy dream of millions with its accompaniment of limousines and shaded lawns was flickering a bit as he asked, "Well, what would you do about it?"

"The first thing I would do if I were you," I replied, "would be to have the patent records searched to see if it has been patented. If it should turn out that it has not it would be a good indication that the thing is new and you would be reasonably safe in proceeding further."

In due time I made a search for him and found that the same thing had been invented by a German who took out a British patent for it twenty-one years ago. Our more recent inventor, who had been perfectly honest about the whole business (he really had worked out the process himself) was sick for a week when he heard the news. Here was this man, spending much real thought and ability to say nothing of other people's money, when a small fraction of this money and effort spent in investigation would have saved everything. As a patent monopoly the invention now fell flat. It remained to look at its hopes as an open competitive business. If its backers thought they could develop special technique and produce it cheaper or better than competitors they had something equally as good as a patent. Finally if it looked as if there would be a big enough demand for the product, even if they could not best their competitors, there would be enough for all in the general scramble for business, it being remembered that the big bulk of all business not subject to a financial monopoly is done in just this way.

What has been said is perfectly general, the same line of reasoning being applicable to any invention and patent. Notice I use the words invention and patent as if they mean different things. Well, they do. The subject of patents and inventions can be com-

pared to a real estate proposition. In this comparison the invention corresponds to the house and the patent to the deed to the house. The first thing one would do before purchasing a house would be to ascertain the value of the house by having an appraisal made. Just so one should proceed with the purchase of an invention. Find out its commercial value. After one knows the value of a house and a satisfactory price has been agreed upon the next step is to have the title searched. The money is paid over upon proof that the title is clear, that is, after one has found out that when he pays his money, he is really going to own the house and nobody can bob up at some future time and claim that house.

In the case of the medallion invention already described, the search showed that it would be impossible to get a good patent for it, in other words, the deed would be defective and no matter how valuable the invention (or house) upon payment of the purchase money one would not own it.

It often happens, however, that one is asked to invest in an invention that has already been patented. It is perfectly possible to be granted a patent for a valuable invention and still have an absolutely worthless patent. In the language of our real estate analogy the deed does not cover the property, it may be for only one small and unimportant corner of it. Therefore, it is just as important to have an investigation made after a patent has been granted as before. This is especially so for a patent in a much overworked field, say the automobile field.

### A Narrow Escape

A friend of mine had a narrow escape in connection with a spring wheel patent for automobiles. There have been hundreds of patents granted for spring wheels. Of course this was not known to him. As is well known, the ordinary pneumatic tire soon wears out and is subject to frequent punctures, so inventors have been trying for years to substitute a wheel that has a solid outer tire and to take up the shocks by various means in the interior of the wheel, such as by spokes, a wheel within a wheel with a pneumatic tire between them and spring hubs.

I was riding home in the subway one night when some one next to me popped up and said, "Why you're just the party I wanted to meet. A group of business men and myself intend to back up an inventor who has a great thing. There are ten of us and we are each going to put in $1,000 apiece. Of course that's only going to start the thing, because it really is a million-dollar proposition. Every automobile in the country can use it. It saves the tires. No more punctures. He has a wheel with a small leather tire about the hub. The spokes bang up against this hub tire which takes up all the shock. The rim of the wheel is in sections, one section to each spoke and each section is covered with a piece of solid rubber tire."

"Listen here, Dave," I said, "the woods are full of patents for inventions similar to that. Only the other day as I saw an automobile with resilient wheels driven down Broadway, and they were trying to sell stock from the car. Maybe your inventor has something different and better than all the rest, but the chances are against it for a good patent. Of course, it isn't fair to pass judgment offhand like this, but I'd go slow if I were you."

"Well, I'll tell you what I'd like to do," said Dave. "Next Saturday afternoon we are going to have a meeting of the people interested at a Mr. Sands' office. He's a jobber in leather goods at 7—0 Broadway. The inventor will be there, too, and if everything's all right we are going to put up the money. I want you to be there. At the beginning anyway you can pose as a friend of mine who is interested and might put up some money. Then if the thing doesn't look good to you, let loose. I get off the train soon, but before I go I want you to answer me one question. How is it that so many patents, as you said, can be issued all for the same invention? I thought if a man had a patent for an invention nobody else could have one."

### Many Patents of the Same Invention

"Well you see," I said, "an invention is usually composed of a number of different parts all of which acting together make up the whole. Take for instance our wheel. There are the tire, the rim, the spokes and the hub, which fastened together make up the wheel. Now suppose you were the first man in the world who ever thought of a wheel and that you took out a patent for it. Your patent, if properly worded, would claim any round object that revolved on an axle. It would be what is known as a basic patent. Basic patents are the wheat among the chaff of patents and they are few and far between. Your patent would be so broad that it would stop anybody from using any kind of wheel, whether it was a solid disk wheel, a wire wheel, a wheel with wood spokes, a pneumatic-tired wheel or an iron-tired wheel. As soon as your invention became known to the world, people would be quick to see how good it was and begin to make improvements. Mr. Jones would invent the solid disk wheel and patent it; Mr. Smith would do likewise with a wire wheel, etc. The result would be hundreds of different patents for different kinds of wheels and for the different parts of a wheel. Your patent, covering all wheels, being good for seventeen years, all these other inventors in spite of the fact that they had patents would not be allowed to use their improvements without first paying you for your permission. As time went on and seventeen years passed, your patent would no longer be in force. Now everybody could make wheels in accordance with their patents. Hundreds and hundreds of patents would now be obtained, each differing from the other only in some small detail of the wheel and having a value equal only to the value of that detail over the others. The vast majority of all patents issued, no matter what the field, comes under this last-mentioned category. If the detail has value then so has its patent, but if the detail be unimportant, the patent is worthless because by substituting something else, the patent can be beaten."

Saturday afternoon came, and, in accordance with our appointment, I went to the meeting with Dave. Mr. Sands' office, where the meeting was to be held was on the fourth floor of a typical loft building on Broadway north of Canal St. The prospective investors were already in the room when we arrived. They were at the windows looking down at the heavy auto traffic.

"Just think of all those automobiles using our wheels," gleefully remarked Mr. Sands. "And each car would use four of them!"

The continued whir of traffic was music to their ears as they gathered about the table for further consid-

eration of their project. The report of a bursting tire from the street below threw them into an ecstasy of joy, and someone remarked, "Well that won't happen when our wheels get on the market, we have no tires on the outside to be punctured, ours are at the center around the hub where they are protected."

Near one end of the table sat the inventor. He was holding a small model of the wheel on the table before him and was pressing in the telescoping spokes as he explained how it worked. One glance was enough to show me that the thing would hammer itself to pieces in a short time under service conditions. It was hopeless.

A few specific objections on my part threw the inventor into a breathless torrent of words and abuse. He knew what he was talking about, so he said, because he had been in the garage and automobile business for years, and knew everything about a car. Besides what could an outsider know about such things? He knew all about the slipping and skidding of cars and where did I come in. His argument about being a practical automobile mechanic and therefore being in a position to know, made a good impression on his hearers and put me at a disadvantage. It was useless for me for the time being to follow this method of attack. By this time everyone knew my true capacity. I asked him if he had a copy of the patent with him. I read over the claims of the patent and as I expected they were worthless. The claims of a patent are practically its whole value. No matter what wonderful drawings and descriptions a patent may have it is worthless with poor claims. The claims are those little numbered paragraphs at the end of a patent which tell how your patent differs from all the others. The claims of the automobile wheel had as their new feature a *polygonal*-shaped tire at the hub. So if some one made the wheel with a circular tire at the hub he could beat the patent. The inventor not knowing anything about claims thought he had a patent on an automobile wheel with a tire at the center while as a matter of fact he had a patent only on a wheel which must use a *polygonal* tire at the hub. Of course a round tire was just as good, if not better, hence the patent was worthless.

READ CHIEFLY BY YOUTHS AND AMATEURS

Almost every thinking person at some time or other in his career has the invention bug. Some follow the matter through and obtain patents, while others are content to enthuse a little and dream about it and let it go at that. The amount of energy and money spent on patents is far greater than the public suspects. Every week over 700 patents are issued. In a year there are about 90,000 applications filed of which about 35,000 come to issue. Counting the time of all the people involved as well as the money spent in fees and experiments, $100,000,000 per annum is a conservative estimate of the country's expenditure. And over 90 per cent of it is wasted!

Some idea of the extent of the heartbreaks involved in this loss can be obtained from the answers to an advertisement inserted in a Sunday addition under the "Business Opportunities" columns of one of the big New York newspapers. The advertisement which was inserted in good faith by a client looking for something to manufacture read as follows:

"Retired business man will finance and develop meritorious patent or idea. Address Z144 Annex."

For ten days the newspaper kept forwarding him replies. One answer was from a tailor on his tailor-shop letterhead about a detachable rim and expanding wheel for automobiles; another from a clerk in the foreign teller's department of a big Wall St. bank in regard to a new tire. It is safe to say that he did not have his mind on foreign exchange all during banking hours. A clever letter was received from a daughter who wrote that she was the administratrix and heir to her father's estate and that as he was an inventor rather than a business man, it consisted of little else than inventions. Then followed a list and description of them, all requiring capital for their development. A little thought showed the pathos behind this letter. He had wasted his life and to a certain extent hers, and left as a heritage her desire to perpetuate his forlorn hopes. And there were dozens of other inventions submitted, from a mayonnaise mixing machine by a delicatessen man to an aircraft scheme for long distance passenger and fast freight service by an ex-naval officer and a new kind of rotary steam engine by a college professor. Irrespective of their possible merit, some of them would require nothing short of a special government department to see them through.

There are published several weekly and monthly papers, profusely illustrated, which write about mechanics and science in popular and exaggerated style. These papers are read chiefly by youths and amateurs and whet the invention appetite to white heat. And in their advertising columns are to be found big display ads of certain patent attorneys who fairly run wild in this happy hunting ground of inventors. The result is that thousands of patents are procured for half-baked ideas doomed to failure. And strange as it may seem this phenomenon is not without its good results. It follows natural laws. Nature is prolific. Thousands of seeds are produced in order that a few may survive. These magazines spread scientific knowledge where it ordinarily would not reach and now and then the germ of a great idea is to be found in a half-baked invention. Most startlingly new ideas come from the rank outsiders anyway. Those entrenched in a particular field become cautious and conservative; they know the pitfalls, whereas an outsider is often the "fool who enters where angels fear to tread," and once in a while gets away with it.

It seems a pity that so much energy and money are wasted on inventions and patents when by the application of a few simple principles most of it could be saved. This would also result in giving inventions of true merit a better chance for a hearing, instead of overwhelming them by the general ill repute of the others. The tantalizing part of it all is that there remains a tremendous field for invention as most of the arts are still in their infancy.

# Magnetic Chucks—II

BY ELLSWORTH SHELDON
Associate Editor, *American Machinist*

*(Continued from last week.)*

DURING the month of January, 1917, another name was added to the rapidly increasing roll of aspirants for distinction in this field. George G. Pragst, of Providence, R. I., obtained a patent which he immediately assigned to the D & W Fuse Co., upon a single-magnet chuck designed to take separate work-holding plates with any desired arrangement of pole-pieces to hold work of various sizes and shapes. Several such shapes are covered by the patent which is shown in Fig. 38; though but one is illustrated, as the principle involved is the same in all.

Incorporated in the specifications and claims is a new and ingenious method of sealing the chuck against water, and though the usual precautions are taken to make the work-holding plates proof against leakage by beading and staking the non-magnetic metal, it really doesn't matter whether they leak or not for the chuck body is supposed to be water tight with the plate off.

The chuck body is a shell of cast iron with a single hollow hub projecting up from the bottom but rising not quite so high as the side walls of the shell. This hollow hub is the core of the magnet and in the finished chuck is surrounded by the energizing coil.

A steel disk of a thickness equal to the difference between the height of the hub and the height of the side walls has a brass ring of a certain width forced on its periphery "preferably by hydraulic pressure." The outer diameter of the brass ring is made to fit the inner diameter of the shell, and when the brass bound disk is forced into the shell and further held by screws (having lead washers) to the hub; and a brass bushing forced into the central hole, there is no doubt but that the chuck should be water-tight whether there is an auxiliary work-holding plate on it or not.

With such a construction of the chuck body almost any arrangement of polepieces in the work-holding plate is permissible. All that is necessary is to see that the skeleton plate does not touch the steel disk and that the inserted polepieces do. To make this condition certain each skeleton plate or grid has a raised rib around its periphery to match the edge of the shell.

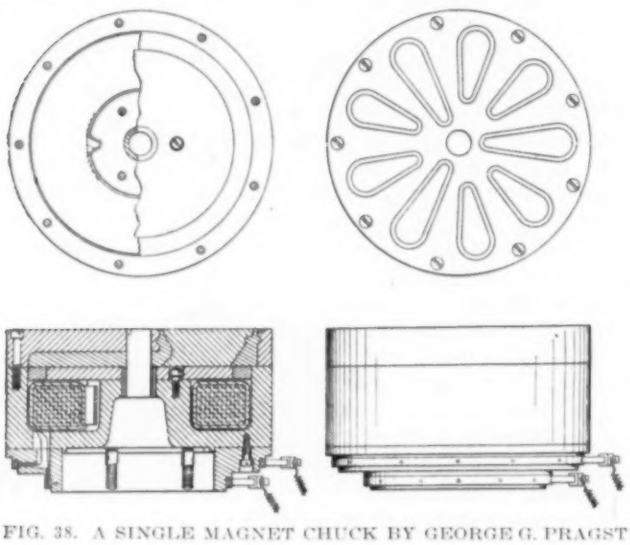


FIG. 38. A SINGLE MAGNET CHUCK BY GEORGE G. PRAGST

Fig. 39, a patent issued to O. S. Walker in April, 1917, should be carefully studied. It marks the completion of the cycle of evolution, if a cycle of evolution can be said to be complete. Though the chuck of 1873 was round and the chuck of 1917 square; though the former was the crudest conception of an electromagnet

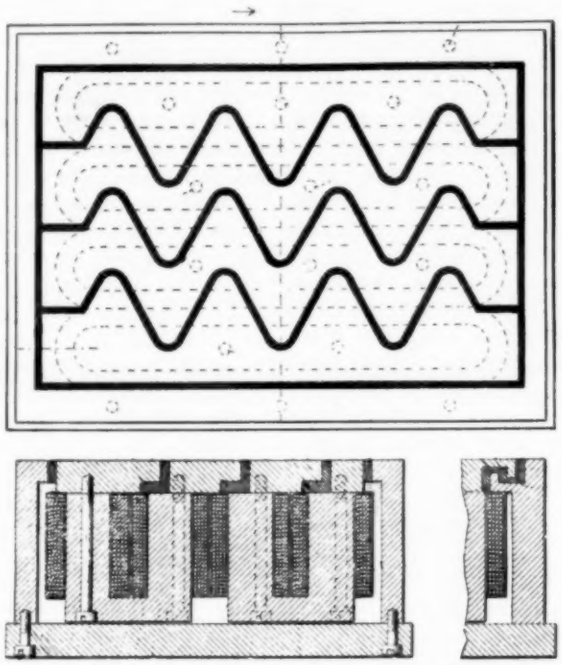


FIG. 39. A MODERN FORM OF INDEPENDENT MAGNET CHUCK

and the latter a development of years of experience; though the one was a toy and the other a practical tool; in principle the device is right back where it started from forty-four years before.

Now, as then, the top or work-holding surface is composed entirely of actively magnetic poles each with its individual coil. Now, as then, the magnet does not rely upon the casing which holds it, and the latter might as well be made of wood or brass; or, as a year or two later it was to be, of aluminum; so far as its effect upon the work-holding capacity of the chuck is concerned. The "independent-magnet" chuck is again back on the job.

The chuck shown by the patent drawings has but two pairs of magnets the cores and polepieces of which are disposed parallel to the longer dimension of the body, but this is only to illustrate the principle. It is obvious that the shorter dimension could easily become the longer one by extending the shell in that direction and putting in more magnets.

As in this form of chuck both cores and polepieces can easily be forged, thereby allowing the use for these parts of material of a much higher magnetic permeability, there is no longer need for or advantage in casting them. The shell is still of cast iron, but this shell has become merely a box in which to assemble the parts. It could be made of wood except for the requirements of accuracy and mechanical strength.

The cores and polepieces of this chuck are specified to be made of Swedish iron; the polepieces to be shaped at the ends as shown in the sectional elevation to form an interlocking joint with the shell that, when the soft metal is poured, will unite the whole in a rigid water-tight structure. For convenience in assembling, the shell is cast as a rectangular frame, open at the bottom, and this opening closed by a flat plate after the U-shaped magnet cores, with their coils in place, have been attached to the polepieces of the magnet by means of long fillister head screws.

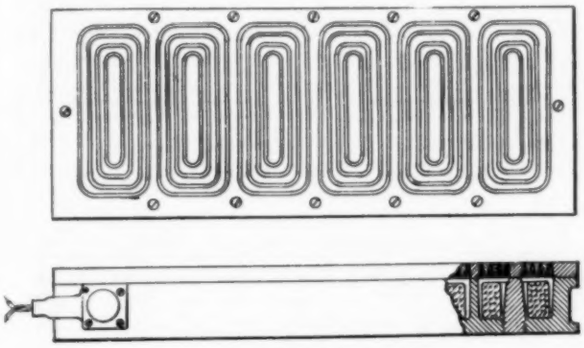
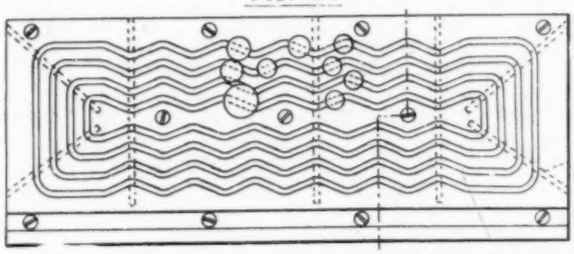


FIG. 41



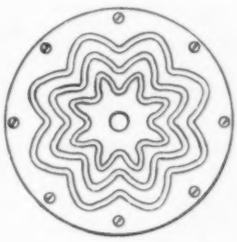


FIG. 42

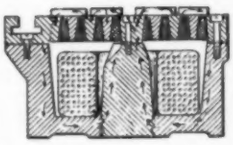


FIG. 40

FIGS. 40 AND 41—TWO FORMS OF SINGLE MAGNET CHUCKS BY DOWNES & PATTON. FIG. 42—THE DOWNES & PATTON IDEA APPLIED TO ROTARY CHUCKS

The serrated edges of the polepieces are for the purpose of securing a wider distribution of holding power, and are, of course, so formed on their under surfaces that they do not make magnetic contact with more than one core.

### Downes and Pattons Chucks

In July, 1917, Louis W. Downes and Ralph Clifton Patton, both of Providence, were granted a patent, which they immediately assigned to the D & W Fuse Co., upon still another form of single magnet chuck; the variation between this and preceding patents held by the same company being principally one of construction.

The shell is a box of cast iron, either rectangular or circular as the case may be, with a central hub or core of wrought iron cast in place. Two forms of construction are covered in the claim; one with a single large core and coil, the other with a number of smaller cores each with its own coil. There is no difference in principle; both are single-magnet chucks, but the arrangement of polepieces presents a markedly different appearance. One is shown in Fig. 40; one in Fig. 41, while in Fig. 42 may be seen the same arrangement adapted to a rotary chuck.

Only the outer frame of either form of top-plate is in contact with the shell of the chuck, only the inner section is in contact with the central core; consequently only these two parts are actively magnetic. The intermediary rings are left "in the air" as it were and are magnetic by induction. Such a chuck would, apparently, hold quite well if fully loaded with small pieces, and not at all well if only partly loaded.

An ingenious method of constructing the top plate is devised. If these plates with their multiplicity of sinuous frames had to be assembled it would be a discouraging job, but by simply casting each plate complete as a thick plate with deep grooves cored in it, pouring the grooves full of soft metal and staking it in, and then planing off the web from the side that had rendered the original casting continuous, the top plate is completely assembled without ever having been apart.

On the same day, July 10, 1917, that the Downes and Patton patent was issued, Mr. Griffith of Worcester took out his second patent for the Heald Co. This patent does not involve a new form of chuck but is rather to cover a detail of construction.

The original Griffith's chuck was a multiple-magnet chuck with the magnet cores cast integral with the body. The new construction would cast the shell the other side up with elongated holes in the bottom and thus the bottom of the shell as cast becomes the work-holding surface. The cores and polepieces are forged from "magnet steel" (each core and polepiece being a single forging) and are set in the holes in the bottom of the shell and babbitted to place. The upper ends are then faced off and, after the coils are set and the connections made, a flat cover put over the whole, being fastened by screws to the rim of the shell and to each core. The new chuck differed little in appearance and not at all in principle from the previous one by the same inventor.

### The Independent Magnet Chuck Again

Frank L. Simmons of Millbury, Mass., has not heretofore appeared as a patentee of magnetic chucks, but that does not signify that he is a new-comer to the field. For many years Mr. Simmons had been working and experimenting along this line, and his application for the patent issued Jan. 29, 1918, had been filed nearly four years previously.

Mr. Simmins' chuck is shown in the drawing Fig. 43, and though quite different in construction from the device as now manufactured by the Taft-Pierce Co. of Woonsocket, R. I., is the same in principle and, except for size, differs little in appearance.

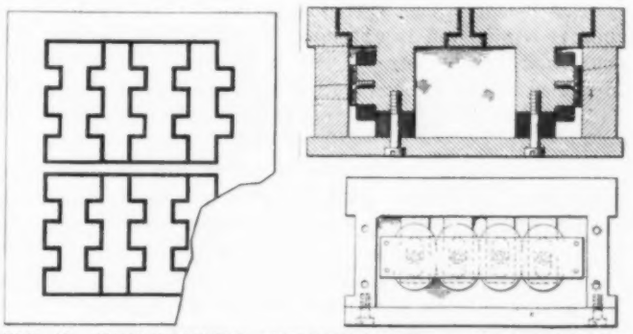


FIG. 43. THE SIMMONS "INDEPENDENT" MAGNET CHUCK

In the drawing each polepiece is shown as integral with its core, and a number of such units, with the coils in place would be connected together at each side by a steel strip which constituted the back-bar of that group of magnets. In present day construction each unit consists of four or six cores of cast steel, cast integral with their back-bar. The polepieces are separate and are machined from drop forgings.

From the nature of the independent magnet chuck it is evident that the shell has nothing to do with its holding power; it is simply a mechanical structure the sole duty of which is to hold the magnets in place.

In this original Simmons chuck the top is of cast iron, and similar in section to a channel bar. The two upturned edges of the channel form the sides of the chuck body while the ends and the bottom of the body are separate pieces held by fillister head screws. Two rectangular openings in the web of the cast-iron channel bar leave this piece but a sort of double frame in which to set the magnets and the openings in the frame are rabbetted to leave a shoulder to support the latter in position.

FIG. 44. THE ARTER SINGLE MAGNET ROTARY CHUCK

The edges of the polepieces are serrated as shown in the drawing to break up the work-holding surface into small areas of opposed polarity thus providing for the holding of small pieces.

Mr. Simmons in this design evidently seeks to encompass the feature of accessibility that some years before had seemed good to an earlier patentee. The coils being mounted upon lateral projections of the magnet cores immediately back of the removable end pieces (which become the side pieces when the in-this-case shorter dimension is extended to make a larger chuck) enables a repair man by the removal of a few screws to get at them for rewinding or replacement purposes without disturbing the permanent structure of the chuck.

If water-tightness is sought, these removable covers may be set on rubber gaskets without interfering with the accuracy or efficiency of the chuck, whereas gaskets of any kind in any horizontally disposed joint would seriously impair the accuracy of the chuck, while a rubber gasket in such position would be impossible.

The construction, however, has, like all other attempts to make the interior of the chuck accessible, been discontinued in favor of the "iron-clad" idea, wherein the endeavor has been to make repair and replacement unnecessary instead of easy.

### Another Advocate of Single Magnet Idea

William Arter of Worcester, Mass., is a member of the firm of Persons-Arter of the same city, builders of

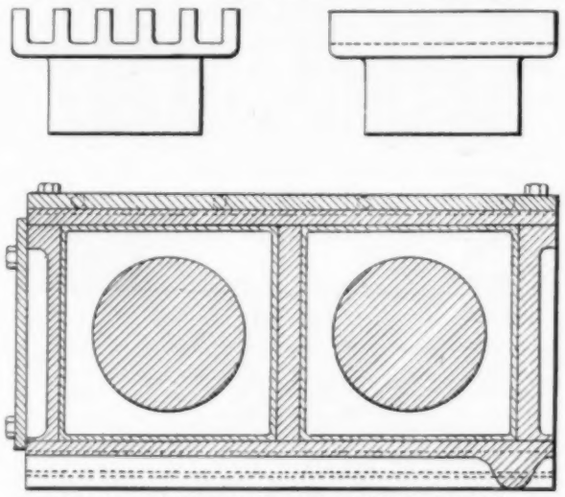


FIG. 45. DETAILS OF THE ARTER CHUCK. RECTANGULAR FORM

grinding machinery. Mr. Arter, coming in violent contact with the limitations of the magnetic chuck as it is applied to rotary grinding machines, sought to build for his machines a better chuck than he could buy on the market. Whether or not he succeeded is not for us to decide; we can only record the mechanical and magnetic details of his solution.

The patent granted Jan. 14, 1919, to Mr. Arter covers a single-magnet chuck of somewhat different construction than previously patented chucks of its type. The rotary chuck shown in Fig. 44, combines (as has been once done before) two different constructions in one chuck. The patentable feature is in the method of constructing the core and pole-pieces. The two parts are formed by a single steel casting as shown in Fig. 45, which illustrates the chuck in its rectangular form. Any number of these cores may be used to form a chuck of

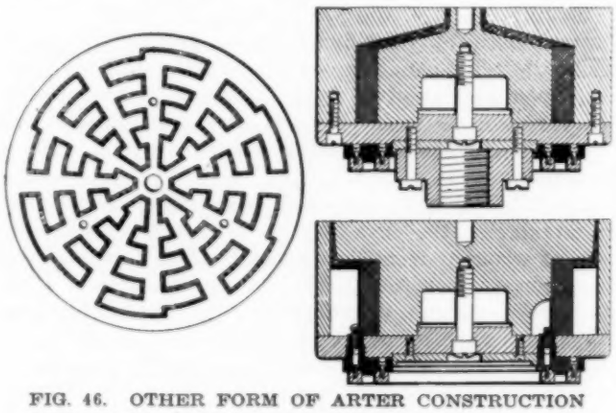


FIG. 46. OTHER FORM OF ARTER CONSTRUCTION

whatever size desired; all the coils being wound one way and all the projecting poles being of the same polarity.

The opposed poles are provided by the bars of the grid which forms the main portion of the top-plate, and the magnetic currents are conveyed from the lower ends of the cores to these bars by means of the side walls, as in all forms of single magnet chucks.

In the central portion of the rotary chuck, Fig. 44, a new shape of polepiece will be noted. This shape is the subject of a separate patent granted to Mr. Arter on Aug. 5, 1919, illustrated in Figs. 46 and 47.

### Insulating the Chuck from the Machine

A feature claimed in the Arter patents which had not previously been put forward relates to the insulation, magnetically, of the chuck from the table or spindle of the machine to which it is attached. On the rotary chuck this is accomplished by the interposition of a brass plate between the back of the chuck and the threaded collar which fits the spindle nose of the machine; bolting the two parts together with brass bolts. On the rectangular chuck "feet" of bronze, held to the chuck body by brass screws, are provided.

The insulation, while not entirely preventing the trouble if there is strong leakage, tends to discourage the passage of stray lines of force through the machine and its tools on the way from one pole to the other of the cores.

Such leakage is seldom serious so far as loss of holding power is concerned; the principal objectionable feature is the eventual magnetizing of cutters or other tools of hardened steel that may be used in conjunction with the job.

### The Latest Walker Patent

Fig. 48 shows a new chuck by Mr. Walker, patented Feb. 3, 1920, which is a return in part to the independent magnet class. Though the drawing shows only the rotary chuck the patent claims, like practically all the others, cover the principle of construction as applied to chucks of any shape. In this chuck the magnet cores are arranged in a ring or in a straight line as the case may be and are of alternate polarity. The entire top surface inside the outer ring or frame of non-magnetic metal is made up of active polepieces so interlocked that no two adjacent sections are of the same polarity.

The segmental polepieces are all alike (as would be the parallel ones in a rectangular chuck) so that but

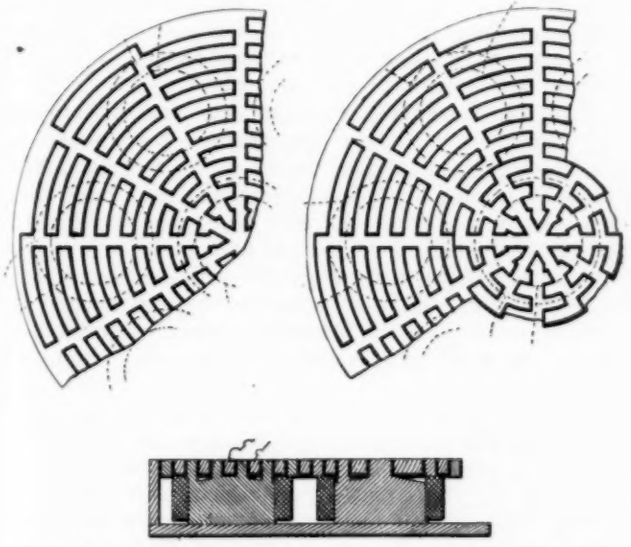


FIG. 47. ANOTHER FORM OF ARTER CONSTRUCTION

one pattern is needed to make up the entire surface; the shape lends itself to the drop-forging process, so that they may be made of the material best adapted to magnetic devices; and the interlocking feature allows adjacent segments to overlap without touching, thus securing the diffusion, so-to-speak, of magnetic flux that best adapts such chucks to the holding of small pieces. A single segment is shown at *A*; two segments interlocked at *B*; and a section of the joint at *C*.

### Modification of the Multiple Magnet Chuck

The latest chuck patent up to the date of writing (June, 1920) was granted on May 11, 1920, to Leon W. Dunbar of Worcester, Mass. Mr. Dunbar's chuck is of

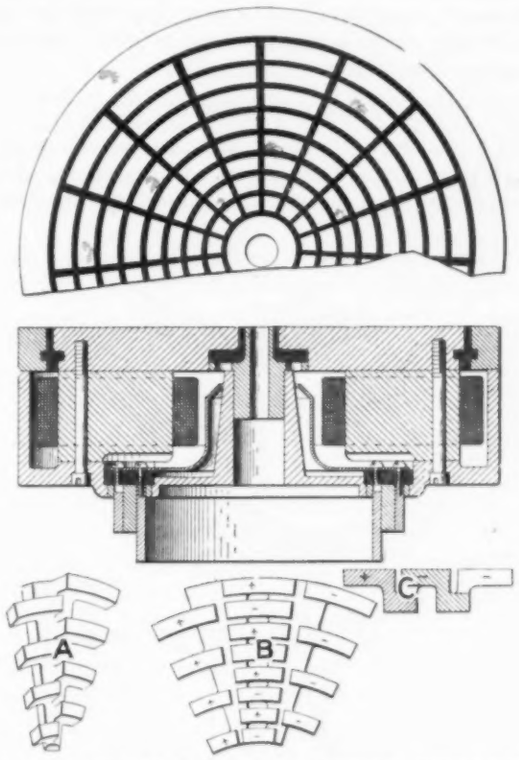



FIG. 48. MR. WALKER MAKES A ROTARY INDEPENDENT MAGNET CHUCK

the multiple magnet type, differing practically not at all in principle from foregoing chucks of the same type, but of a somewhat different construction. While the top plate is a grid, the bars, or dividers are very narrow and do not appear on the surface at all.

### Magnetic Cores Are Each in Two Parts

The magnetic cores are each in two parts (not a pair) and are round. The magnetizing coils are also round, and it is claimed that by reason of each core being in two parts, each part provided with a separate coil, one or more coils may burn out or otherwise become inoperative without putting any part of the chuck out of business.

The polepieces are provided with flanges which project over the dividers of the grids so that there are no neutral spaces upon the surface of the chuck, and each pole rests upon two of the round cores. The coils of these two cores obviously must be similarly wound else a magnetic circuit would be provided within each polepiece and corresponding parts that would nullify any magnetic activity that it would otherwise display, but the two coils are parts of two different electric circuits.

The cores are cast integral with the bottom plate and there may be as many of them as may be desirable to make up the requisite length of chuck. The patent drawings are shown in Fig. 49.

The development of the magnetic chuck has by no means reached its final stage. Powerful as they now are in comparison with the earlier forms, the next few years will, without doubt, bring forth chucks much stronger in gripping power, much wider in range of adaptability, until some day the erstwhile ubiquitous bolt that is much too long or a little too short, and the strap that never has a hole in the right place or is just too thick to allow the tools to clear, will be relegated to their proper resting place on the scrap pile, and the workman will instantaneously clamp his work to lathe, planer, milling or grinding machine by the pressure of his thumb on a button.

### The Alternating Current Chuck

There is no such thing as a magnetic chuck using alternating current. The makers of present day chucks are unanimous and positive in asserting that there

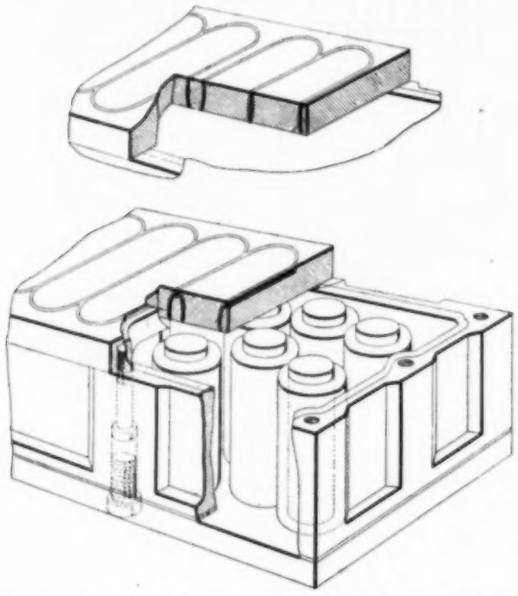


FIG. 49. THE DUNBAR MULTIPLE MAGNET CHUCK. MAY 11, 1920

never will be; but not so many years ago makers of direct current electric machinery were equally positive that the alternating current could never be adapted to industrial power transmission, yet today it is almost impossible to get beyond ear-shot of the contented hum of the induction motor. An inventor (a successful one, too) once told me that the reason why inventors as a class were such erratic people was that "only a man who was such a fool as not to know that a thing couldn't be done had the nerve to go ahead and do it."

Some day some such chap is going to tackle the alternating current chuck proposition and get away with it.

### Shop Methods of Construction

There has been prepared, or is in process of preparation, a series of articles dealing with actual shop methods employed by the various manufacturers of magnetic chucks, to be illustrated with photographs secured in the shops, showing the details of construction of each chuck now on the market. These articles will be followed by others giving a practical description of the way in which irregular shapes must be mounted upon the various chucks in order to obtain the maximum holding power.

## Reminiscences of an Old-Time Machinist

By R. Thomas Huntington

Because of my proficiency in scraping and polishing, acquired during my eight months' experience at Baldwin's upon handrail parts for locomotives (of which kind of work I had become very tired), the first job handed me in my next place of employment was the scraping and polishing of a lot of change gears for lathes. This was in the shop of Bement & Dougherty, builders of heavy machine tools, located on Callowhill St. in Philadelphia.

The gears were what are called "web" gears; that is, they had no spokes, even in the largest diameters. The blanks had been bored and rough turned before coming to me and I had to scrape and polish both sides of the web and rim to a very smooth finish; so they would "wipe easily," the foreman told me.

The lathe on which the polishing was done was located in a dark corner of the shop so that I was obliged to light the gas (a welcome improvement over the old whale-oil lamps I had known) in order to see what I was doing; and this act brought about my first clash with the foreman, whom I considered to be the fussiest individual I had ever met. There was a stop cock in the gas supply pipe under the foreman's desk so that he could shut off the gas with his foot without the effort being apparent to anyone in the shop. One day while I was at work as usual on my polishing job, which, by the way was becoming decidedly monotonous, my gas light suddenly went out. After using up several matches in a vain endeavor to relight it I noticed that my immediate neighbors were surreptitiously laughing at me, whereupon I suspected the cause of my trouble and went over to Mr. Brown and told him I could not see to get the gears smooth (he had already censured me for leaving scratches in them) unless he turned on the gas.

He was quite indignant at my insinuation that he had purposely put out my light and angrily retorted that the gas was all right. I did not believe it and tried to explain how it had gone out and would not light, but he was insistent, so I finally went back to my lathe and found that the gas lighted readily when the match was applied. I have often wondered since whether I was right in my surmise or whether some joker on a nearby machine had blown air in the gas pipes.

Bement & Dougherty were at that time building a large boring mill for the Charlestown Navy Yard to turn bearing rings for the turrets of the monitors. The mill would swing 24 ft. in diameter and was built very much like a planer except that the table was round, and revolved, instead of moving back and forth like a planer table. The main shaft for this machine was 6 in. in diameter and was supported by four bearings, each over a foot long. The bearings were not bored out; instead, the shaft was levelled up in place and the boxes filled with babbitt.

This was my first experience in babbitting bearings. Before the shaft was swung into place plates of sheet iron, each having a hole to fit the shaft, were put on, so that when the shaft rested in the boxes there would be a sheet-iron plate on each side of each box. When the lining up and levelling was complete the plates were clamped to the respective boxes and the babbitt poured between them. After the metal had cooled the surfaces of the babbitt each side of the shaft were smoothed off, thin shims placed to separate the lower half of the box from the cap, the caps bolted to place and poured. When

cold the bearings were opened and scraped to a running fit for the shaft.

The work at Bement & Dougherty's was very heavy and as I was not a very husky lad I soon made up my mind to seek a job that was not quite so strenuous. This I quickly found was not so easy as at nearly every place they inquired where I had been working and upon being told would say that they did not want me; they wanted a man who was used to light work.

However, I eventually secured employment with the Lockwood Manufacturing Co., manufacturers of paper collars and cuffs. Not a promising place for a young machinist, you will say; but the mechanical interest was supplied by two brothers named Packer, who had patented and were building a machine for making envelopes; for which the Lockwood Co. had a government contract. This machine I helped to finish and put into successful operation, as well as four succeeding machines that not only cut, pasted and folded the envelopes but stacked them in packets of 25 each, put a paper band around each packet and put the packets in a box ready for shipment.

The superintendent of the Lockwood plant, one of the most efficient superintendents I ever saw, was a woman. She had all the details of the business well in hand and managed the several departments so well and so unobtrusively that there was never any friction or misunderstanding. She did not remain long after I went there, however; she resigned to get married, and her place was taken by a man, who, though professing to know it all, was far from being as capable as she.

This man was the cause of the brothers Packer closing up their machine shop at the Lockwood plant and moving elsewhere. It was nearly a year before they again became established and in the meantime I had to have a job, which I soon found at the plant of Samuel Merrick & Son, known at that time as the Southwark Foundry.

Here I was put to work on a large planer, planing the valve seats of some engines they were building for sugar refineries.

The Southwark Foundry had one very large pit planer; its capacity being, if I remember rightly, 10 or 12 ft. wide, 20 ft. deep, and 40 ft. long. The work to be done was lowered into the pit and shored up like a boat in drydock. The cross-rail moved over the work, travelling on ways located on each side of the pit and driven by two large screws. The cross-rail cleared the top of the work by six inches or so, and carried two saddles arranged in the customary manner, so that work could be planed down the sides a short distance at 90 deg. or at other angle. They also had a large boring mill, the table of which was even with the floor, the driving mechanism being in a bricked-up space beneath the floor. With this they could bore out a marine engine cylinder 60 in. in diameter to a depth, or length, of 6 feet.

Again finding the handling of heavy pieces telling upon me I sought employment where my labor would be lighter. I worked for a time in a shop doing general jobbing and repair work. Here one job that fell to my lot was to cut a keyway through the hub of a large gear. The bore was 6 in., the length of the hub 10 in., and the keyway 1 in. wide by $\frac{1}{2}$ in. deep. In a modern shop, equipped with electric cranes and keyseating machines, this would be a simple job, but handling the job with block and fall and doing the work with hammer, cold-chisel and file, is quite another matter.

A machine for making bricks by the extrusion process, taking the clay in a hopper and extruding a section 2 x 4 in. in size and automatically cutting off every 8 in., was one of the products of this shop. Another was an automatic machine for folding paper as it came from the printing press. Both these machines are common enough now but were unusual and experimental at that time.

At another small shop, located in a cellar, when I stopped in to ask for a job, the proprietor was boring the cylinder of a small steam engine with a portable rig clamped to the cylinder by bolts in the stud-bolt holes. The whole job was mounted upon two wooden horses and the boring bar was turned by hand. The boss, who seemed glad to be relieved, gave me a job at once and turned the boring over to me to finish. The second job in this shop was the fitting of a setscrew to a pulley hub, the tapped hole in which was a sixteenth too small for it. The boss gave me a saw file and explained to me how to file around and around this screw with the three-cornered file until I had reduced it sufficiently to fit the tapped hole.

Right there I quit.

## Know What You Are Doing and Why You Are Doing It

By Martin H. Ball

The following explanation is offered as a reason why John A. Grill was able to avoid chatter on the job, referred to on page 1196, Vol. 53, of the *American Machinist*, by using the cutting tool in an inverted position while running the lathe backward.

To produce chatter when a cutting tool is in operation there must be an unsteady movement of the work or the cutting tool. Frequently the cause of such trouble is due to a weakness in some of the various members or poorly fitting surfaces between two or more of the working parts which make up the equipment.

From Mr. Grill's description of this particular case it would seem that the trouble was most likely to have been on the work side of the equipment, because of the fact that trouble in the headstock of a lathe due to a poorly fitted or light spindle or any part of the driving device not being rigid becomes most prominent when the lathe is running in the forward or regular direction, as under these conditions the pressure of the cut lifts these moving parts from their seat, given them by the force of gravity, unless the cut being taken is so light that the weight of these parts is sufficient to hold down against the cut without material disturbance, which is not usually the case.

Running in this way is the most favorable condition for the cutting tool, and the various parts that make up its support, extending back to the foundation upon which the lathe rests, whereas running the lathe in the opposite or backward turning direction reverses all of the conditions which obtain in the above-mentioned actions.

While there are other factors that may enter into such a problem I thing it reasonable to assume that when running a lathe backward stops chatter that occurs when running forward the principal trouble is in the work, or work driving mechanism. And if it chattered when running backward and did not when running forward the trouble would usually be found in the cutting tool or its supporting or driving parts.

## Solution of a Trigonometric Problem

BY A. J. PRUSZYNSKI

Given: $a, b, A, B, C$. Required: $x, Y$, Fig. 1.

The lever $L$ moves through a given angle $A$. A pin $P$ mounted in this lever, operating in the slot of a bell crank $M$, moves it through a given angle $B$. Required to find the distance of the pin from the pivot of the lever and angle $Y$, which the lever makes with the horizontal.

Referring to the diagram, Fig. 2, let $OK = c$ and $OL = d$.

In the triangles $ORM$ and $ORN$ we have

$$c = a \sin C - b \text{ and } d = a \sin (C - B) - b$$

Let angle $OPK = E$ and angle $OP_1L = F$. Also let $B - A = G$.

$$Y = C - E; \; Y - A = C - B - F$$

$$\text{or } Y = C - B - F + A;$$

Substituting $C - E$ for $Y$ and clearing

$$B - A = E - F = G \tag{1}$$

In the triangles $OPK$ and $OP_1L$, $OP = OP_1 = x$,

$$x = \frac{c}{\sin E} = \frac{d}{\sin F}$$

$$d \sin E = c \sin F \tag{2}$$

From (1) we have $E - G = F$; substituting this value of $F$ in (2),

$$d \sin E = c \sin (E - G) = c \sin E \cos G - c \cos E \sin G \tag{3}$$

$$\sin E \; (c \cos G - d) = c \cos E \sin G \tag{4}$$

Squaring both members of (4) we have

$$\sin^2 E \; (c \cos G - d)^2 = c^2 \cos^2 E \sin^2 G \tag{5}$$

Substituting $1 - \sin^2 E$ for $\cos^2 E$ in (5) we have

$$\sin^2 E \; (c \cos G - d)^2 = c^2 \sin^2 G - c^2 \sin^2 G \sin^2 E, \tag{6}$$

from which $\sin^2 E \; [(c \cos G - d)^2 + c^2 \sin^2 G] = c^2 \sin^2 G, \tag{7}$

and $$\sin^2 E = \frac{c^2 \sin^2 G}{(c \cos G - d)^2 + c^2 \sin^2 G} \tag{8}$$

Extracting square root,

$$\sin E = \frac{c \sin G}{\sqrt{(c \cos G - d)^2 + c^2 \sin^2 G}} \tag{9}$$

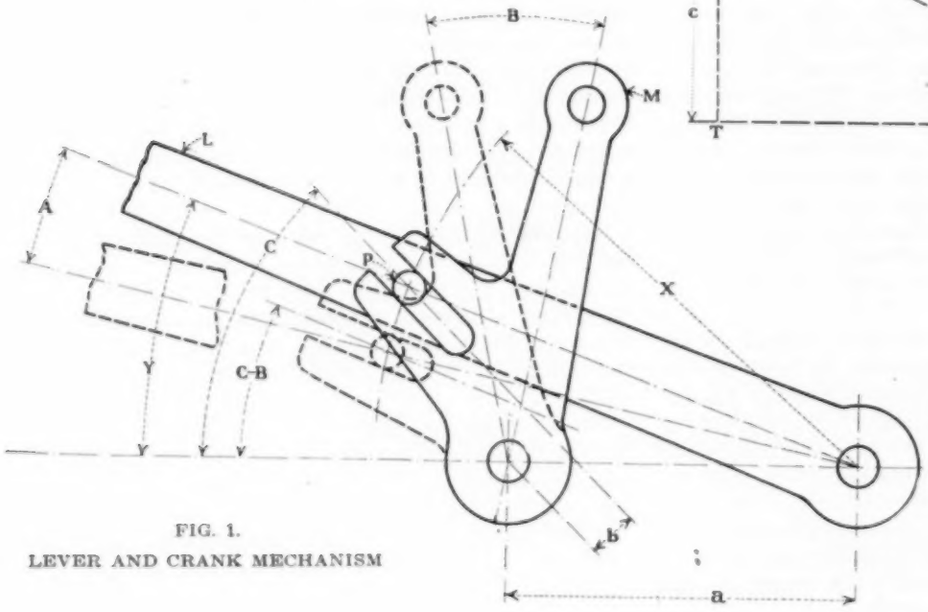



FIG. 1.
LEVER AND CRANK MECHANISM

Expanding denominator of the second member of (9), substituting $1 - \sin^2 G$ for $\cos^2 G$ and simplifying, equation (9) becomes

$$\sin E = \frac{c \sin G}{\sqrt{c^2 + d^2 - 2cd \cos G}} \tag{10}$$

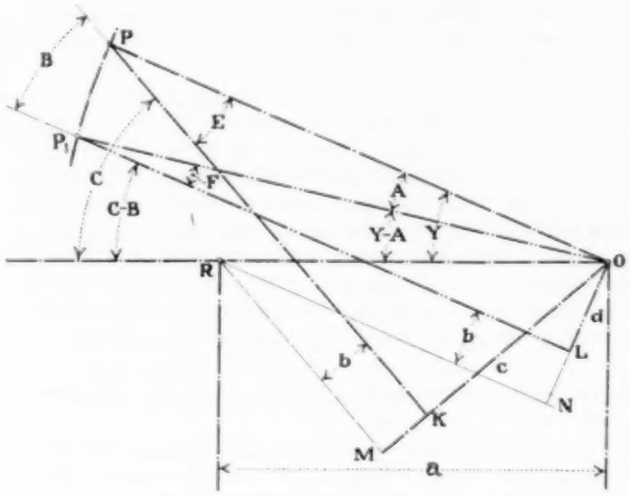



FIG. 2. DIAGRAM FOR DERIVATION OF FORMULAS FOR $x$ AND $Y$

Substituting for angle $G$ its value in known dimensions $(B - A)$,

$$\sin E = \frac{c \sin (B - A)}{\sqrt{c^2 + d^2 - 2cd \cos (B - A)}} \tag{11}$$

$$x = \frac{c \sqrt{c^2 + d^2 - 2cd \cos (B - A)}}{\sin E \sin (B - A)} \tag{12}$$

$$Y = C - E. \tag{13}$$

Equations (12) and (13), while not expressed altogether in known values, are expressed in terms which represent combinations of known values and are therefore easily determined.

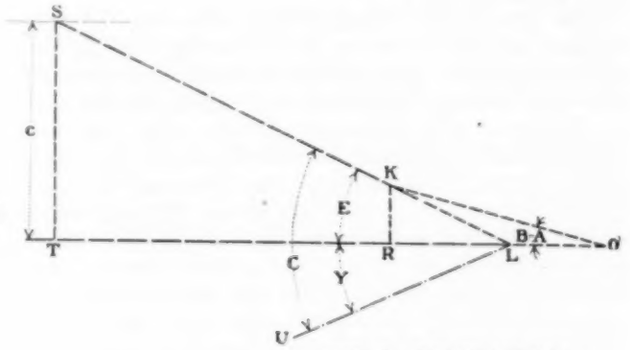



FIG. 3. DIAGRAM FOR GRAPHIC SOLUTION

The problem can also be solved graphically as follows: Referring to the diagram, Fig. 3, let $OK = c$, $OL = d$, and angle $KOL = B - A$.

In triangle $OKR$ we have $KR = OK \sin KOL = c \sin (B - A)$.

In triangle $OKL$ we have

$$KL = \sqrt{\overline{OK}^2 + \overline{OL}^2 - 2\,\overline{OK}\,\overline{OL}\cos KOL}$$
$$= \sqrt{c^2 + d^2 - 2cd\cos(B - A)}.$$

In the triangle $KLR$ we have

$$\sin KLR = \frac{KR}{KL} = \frac{c\sin(B - A)}{\sqrt{c^2 + d^2 - 2cd\cos(B - A)}}.$$

Referring to the trigonometric solution of the problem, equation (11) we find that sine of angle $E$ is expressed by the same formula as sine of angle $KLR$, from which we conclude that angle $KLR = E$. Let $ST = c$ and angle $KLU = C$.

In triangle $STL$ we have: $SL = \frac{ST}{\sin SLT} = \frac{c}{\sin E} = x$.

We find angle $Y$ by subtracting $E$ from $C$, or $Y = C - E$.

## The Works Manager's Problems

By W. D. Forbes

Mr. Martin sat at his desk thinking; he was not just musing. His brain was working at its best and what he was thinking about was not only of moment to him but to all those whose money was invested in the works which he managed.

He drew a sheet of paper to him and wrote as follows:

"After four years of work on certain lines which I had hoped would show satisfactory results, I am forced by the figures before me to say that the output of all the mechanics working for this company has declined in quantity each year; the cost of all articles which we are making has increased in shop cost; the quality of the work has not altered. There has been no advance in good feeling between the management and the workmen, in fact the contrary has been the case.

"What we have done has been, in part, to give the men shorter working hours and this was done with the hope that the shop costs would not be increased. In this hope we were, to some extent, influenced by our own ideas, but more so by the assertions of the men's representatives who promised that the shorter hours would not reduce the product but would, beyond doubt, increase it as the men would then work with greater will.

"The sanitary conditions in our works have always been good but we added shower baths for the molders; made our toilets more comfortable and increased their number. We provided a separate room in which the men could eat their dinner in greater comfort, and we also provided a heating apparatus for the men's coffee.

"We put in metal lockers for the men's clothes and threw the eating room open to all who wanted to come there evenings to read or write and we furnished paper and envelopes for all. We also provided a number of publications for the reading room.

"We gave dances and concerts, furnishing something to eat and drink at each; we offered to provide teachers for any who wished to take up mechanical drawing or other studies, but only a few applicants appeared so that idea was given up. Our pay roll has been advanced on an average of 15 per cent. It is evident that all this has cost us money though we had hoped that it would be money well expended.

"I find now that while the shower baths were at first used by nearly all the molders they are now seldom used. The toilets have become a place for loafing, more than ever before. The eating room is used by some but most of the men have given up its use, evidently preferring to eat in the shop. The entertainments have been less and less attended.

"Taking it all around I feel that all that we have done has not in any way bettered either the men or the company. I strongly recommend that we close the eating room and discontinue the publications we have been taking for the men; that we return to the 9-hour day leaving the wages as they are and close about one-quarter of the toilets. I would have each man put up a sum to cover the cost of the key of his locker, as keys are often lost. I also recommend that we return to our old piece-work system.

"All this can not be accomplished without friction, but we are having that now and losing by it daily, so we might as well have the friction gain us something.

"I have talked with many of our men and a great number of them are quite willing to go back to the piece-work system. Some oppose it, but I am much inclined to think that this is because of instructions from others and not of their own wills. Those who object to the piece work are always the poor workmen.

"All the men willing to return to piece work are also willing to return to the 9-hour day; in fact they want it when doing piece work. There is no use disguising the fact that the return to the 9-hour day will cause the most trouble, but I think it can be done as I find many men who prefer the shorter day.

"They say in winter the time hangs heavy on their hands and that they spend more money to pass away the time. I do not find 1 per cent of the men taking advantage of the time gained by shorter hours for study. The men say that in summer if they have gardens the shorter day does give them more time to work in them, but few have gardens as is evident. Work is very slack now and it will be some time before new orders may be looked for, and as we can by a little care get all our present orders out in three weeks, it would be well to close the works for a month. We could repair our tools, make the few changes we have been considering and then start up with as many of our old hands as are willing to come to work.

"Piece work is the only way by which we can earn our regular dividends and the question is, shall we continue to run as we are now doing, not making legal interest on our capital, or shall we take the bull by the horns and take what many will call a reactionary step? I know that we cannot grant other changes asked for by the men and gain anything; it is foolish for them to think that we can. It will be hard to get new men but I believe we can get them by making our piece work prices attractive."

Here is something for readers of the *American Machinist* to think about. I know that many managers of shops are thinking along the lines that Mr. Martin has set down, and today I believe it is about the line of thought of most investors in industrial stocks. With increased wages we shall always be forced to do one of three things: take less profits, pass the increased cost on to the consumer, or get the men to produce more for the increased pay. With shorter hours the latter will be difficult as there is little willingness on the part of most men to help in this direction. Passing it on to the consumer is not as easy as it was and to take less profits will result in no money being available for carrying on the works or building new ones. I think Mr. Martin's suggestion could be carried out today. What do others think?

# Grinding in Valves in Motor Heads

## Machining Methods Used on Holt Tractor Valves — Details of Grinding Machine Mechanism

BY FRANK A. STANLEY

THE accompanying illustrations show the method of grinding in valves in motor cylinder heads at the Holt Caterpillar plant at Stockton, California. The special apparatus combines in one group, capacity for six heads to be operated upon simultaneously as illustrated by Figs. 1, 2 and 3. The last two of these views show the complete arrangement of equipment as installed over the grinding bench. Fig. 4 shows the grinding machine proper; that is, the machine by which the combination of movements is imparted to the valve being ground in. Figs. 5 and 6 are assembly drawings of the grinding machine. This machine has some novel principles and its operation will be seen upon inspection of Fig. 4, and the line drawings referred to.

Referring to Fig. 5, crank disk *A* is turned in the direction of the arrow, turning the large gear *D* through the medium of the pinion *B* which is kept in mesh by a connecting rod *C*; gear *D* with its shaft *K* being mounted on a pendulum *E* and shaft *K* being keyed also to gear *F* which, as it swings on the pendulum, keeps in mesh with gear *G*. The latter gear which is carried on a shaft at the top of the machine frame

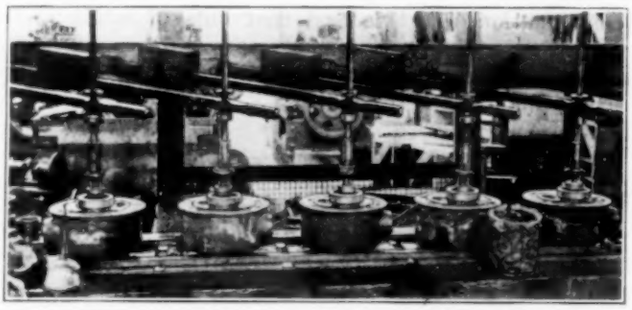


FIG. 1. ROW OF HEADS WITH VALVES BEING GROUND IN

drives in turn the gear *H* and the main shaft *I* to which *H* is keyed.

Now, when crankpin *A1* turns in the direction of the arrow and the large gear *D* in the direction of the second arrow, the small gear *F* cannot drive gear *G* as fast as would be indicated by their relative numbers of teeth because the throw of crank *A1* moves gear *G* in the opposite direction as indicated by the arrow over the top of that gear. But when crank *A1* passes

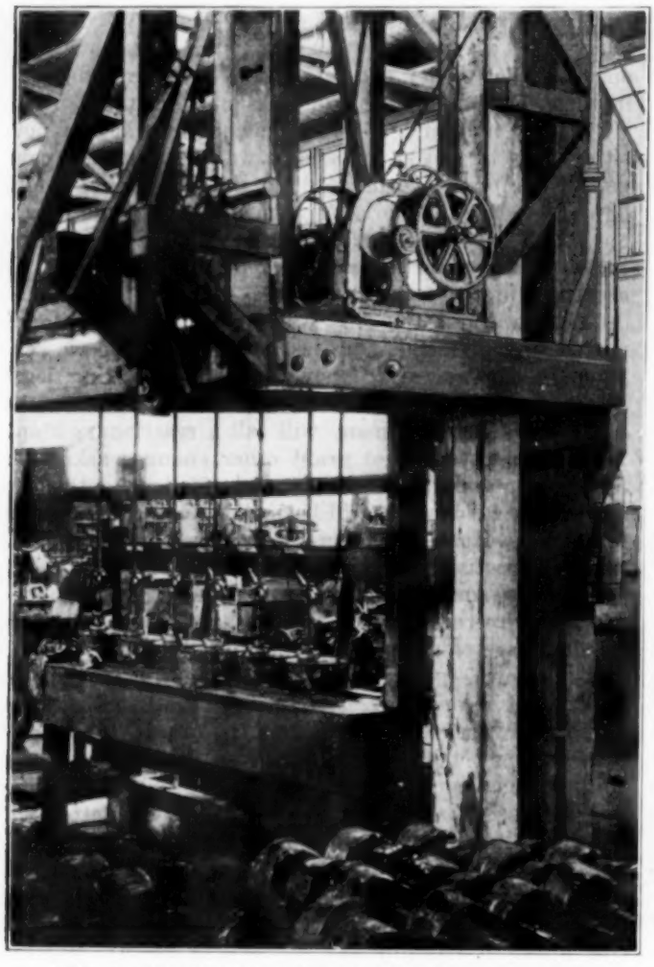


FIG. 2. GRINDING MACHINE COMPLETE AND IN OPERATION

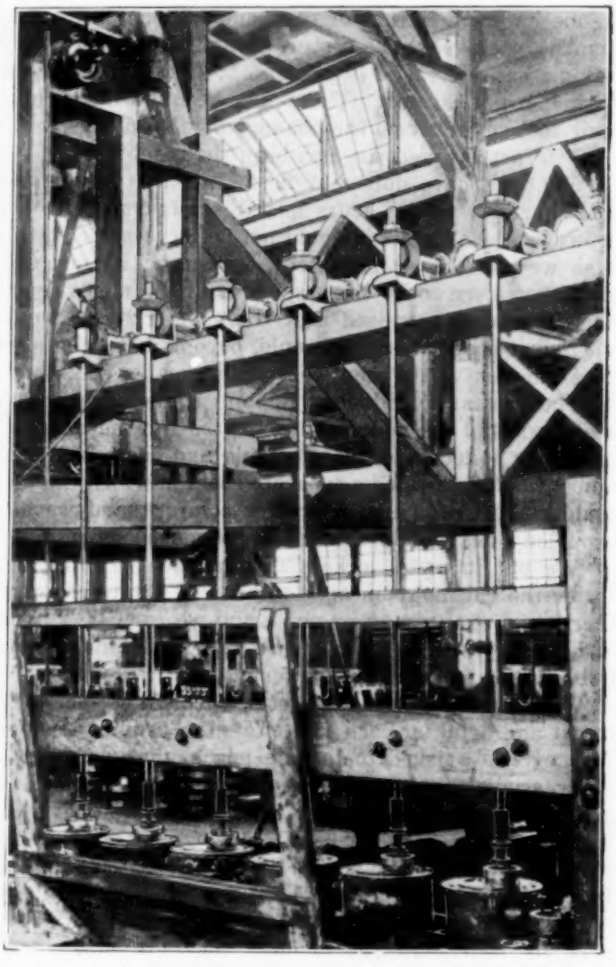


FIG. 3. CAM MECHANISM FOR LIFTING SPINDLES AND DRIVERS

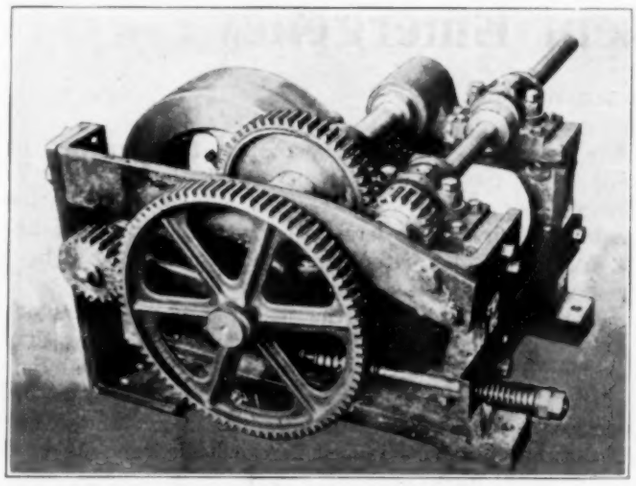


FIG. 4. VIEW OF GRINDING MACHINE MECHANISM

the center *B1* the gear *G* turns in the other direction and not only is being rotated by gear *F* but is doubled in speed by the throw of the crank *A1* and the pendulum *E*, making shaft *I* turn about two-thirds back and six-fifths forward, thus always gaining. On the main assembly drawing, Fig. 6, long shaft *I* is shown driving bevel gears *M* and *N* and on the other side miter gear *O* drives gear *O1* and through this the vertical spindle *P*. This spindle in turn drives a tool-steel blade *U* which is held by a setscrew in the head *S* which slides up and down in a sleeve *P1* and slot *Y*, tension being derived from spring *S1*.

A lever *T* is provided to lift the spindle *P*, disengaging gear *O1* from *O* when changing heads *R*. A lever arrangement is provided to lift valve *Q* about every 3¼ turns to allow the grinding material to flow between the valve and seat. This is operated by the rod *X* and cam *X1* which is driven from the main driving shaft *J*. It will be seen that when lever *T* is swung down the blade *U* will engage in valve *Q* before gears *O* and *O1* are in mesh due to the action of the spring *S1*. This spring also gives a

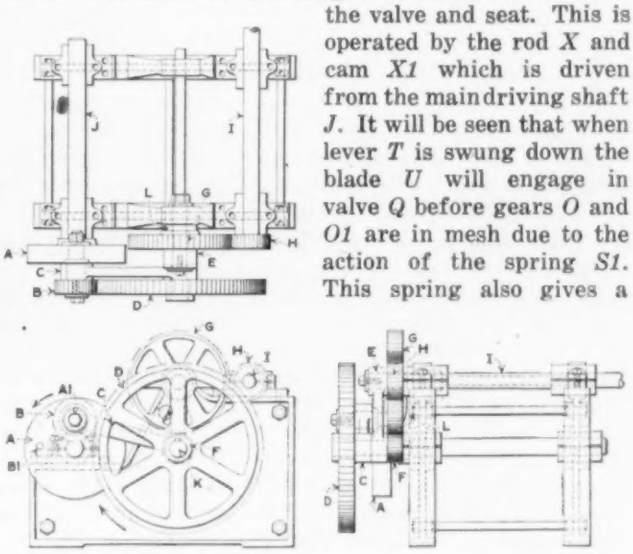


FIG. 5. DETAILS OF VALVE-GRINDING MACHINE

uniform degree of pressure of the valves against the seat. The vertical spindles, the driving blades *U* and the controlling levers and cam mechanisms are all seen clearly in the different photographs, Figs. 1 to 3. The machine shown is the design of P. A. Udall.

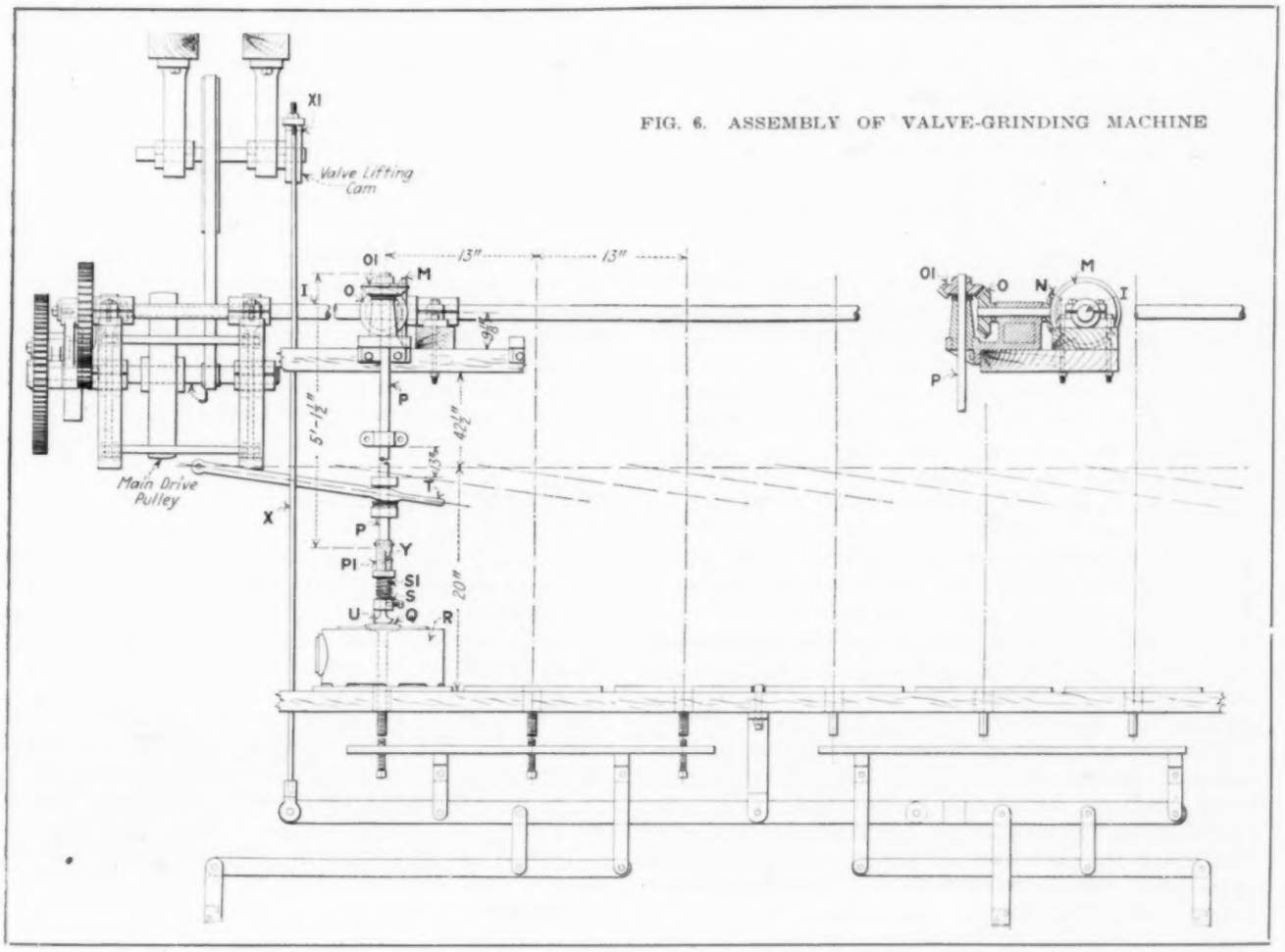



FIG. 6. ASSEMBLY OF VALVE-GRINDING MACHINE

# Meeting the Present Emergency

BY ANOTHER GENERAL MANAGER

THERE is not much to write. We find almost no business coming in. It is much worse than ever before at any time since we started in business; 1907 and 1914 were not nearly as dull years at any period as the present. We have cut our productive force from around 600 to 150 or a little less, and the non-productive, of course, not so much, as that is always an impossibility. We are running about 35 hours a week, both shop and offices.

In the spring we were behind on our orders and in April we had orders for as many machines as we ever did in any one month and were pushing things to the limit. Therefore when the slump came in the fall we had a large stock of machines on hand and for that reason could not keep on building, as we would be willing to do if we had not such a large stock on hand. In previous years we have kept building right along through the dull times so as to have a stock against the revival of business, but with something like 250 machines in stock at the present time we do not feel that this can be done now as the financial load would be too great.

### DEVELOPING NEW MACHINES

We realized last August that the wise thing to do would be to develop some new machines if we could and that a less expensive tool for the repair man would be a desirable tool to have. We went to work on this and we are sure it will bring us some business just as soon as the repair shops get enough work in the shape of overhauling cars to lead them back to their present equipment. Furthermore, there are new firms starting up all the time in this work so that we expect that we will get some business on this machine.

So far as prices are concerned, we have made no reductions yet. We do not believe in making reductions just to line up with the prevailing trend of thought. We believe the correct way is for a company to go over their costs carefully and if they find some of their machines are actually overpriced, to make a change in their prices in conformity with that information and then announce just that amount of change. We think it puts the manufacturer in a great deal stronger position to say that he has found he can do just this than it does to simply send out the statement that he will make no changes in prices. It looks, then, as though the matter had received actual consideration and that the prices were based on real figures rather than modified to suit the popular demand, or kept where they were simply on the principle of standing pat.

The writer feels that the machine-tool builders are due for quite a long period of quiet, much longer than the manufacturers of merchandise. The man who builds washing machines or carpet sweepers, victrolas, motors and automobiles can get going again in fine shape, and in fact be very busy indeed before he is going to need much additional equipment. This is further accentuated by the belief that labor will produce more per man in the next six months than a year ago, so that the need of additional equipment will be still further delayed. In the meantime the factory expenses are going along, and further reductions in prices will not help much in paying these bills.

### BELIEVES IN GUARANTEEING PRICES

Considerable discussion has come up with regard to the guaranteeing of prices, which seems to us to be a perfectly natural, straight-forward and proper thing to do. We know that a great many manufacturers think this unwise. But it seems to us as though if they were buying instead of selling they would be pretty anxious to have perfect assurance that the prices would not drop on them shortly after they had made a purchase. It almost seems as though some of the people that argue against guaranteeing prices wanted to reserve to themselves the privilege of making a cut whenever they found it necessary on account of a little stiff competition on some order and the guaranteeing of prices would get in the way of doing this easily.

"Confidence" seems to us to be the corner stone of good business and if every manufacturer could agree, and stand by that agreement, to maintain prices for six months or a year the chances of doing business would be greatly improved. A customer is oftentimes urged to place his order to protect himself against a raise in prices, and should he not receive assurance against a drop in prices when he comes across with his "John Henry" at the bottom of the order blank?

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BY THE GENERAL MANAGER OF A LARGE EASTERN MACHINE TOOL COMPANY

I HAVE carefully read the article "Meeting the Present Emergency" on page 104 of *American Machinist*, and am almost convinced that it might have been written by a member of our own organization, so accurately does it describe our present and proposed future practice, and our ideas regarding the development of the near future.

We have not reduced wages and shall not do so unless it becomes absolutely necessary. We have reduced our force first by the elimination of the least desirable, but followed by the laying off of a good many men whom we shall be most anxious to have with us again when conditions permit. We are working four days of eight hours each.

Our program is to have a few of every type of machine in stock for immediate delivery but not to stock very heavily, because of the fear that selling prices will have to drop below present manufacturing costs. We are developing our new ideas and getting them ready for the market.

We believe that improved business is coming in the near future—not with a rush, but with a gradual growth along sound lines. The excess profits tax is the most troublesome factor with which we have to contend.

It seems that this statement adds nothing but a hearty amen to your original article on Meeting the Present Emergency.

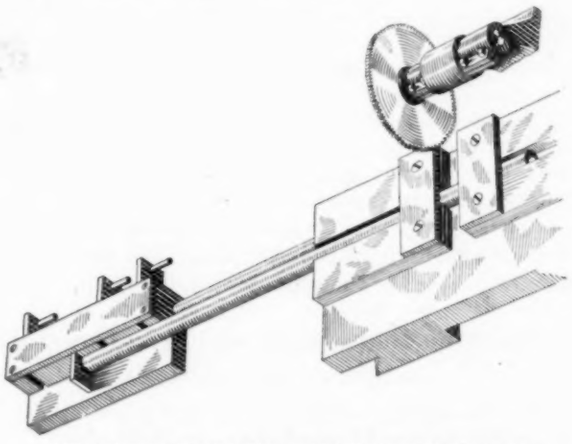
## A Device To Reduce Wastage in Cutting Random Lengths of Brass Tubing

BY DONALD A. HAMPSON

We had a lot of several hundred thousand brass tubes of different lengths, to cut. The tubing was received in 14-ft. boxes weighing three hundred pounds each and filled with random lengths just as cut at the mill, these lengths being from 2 to 14 ft. It would have been possible to order the tubes in multiples of the finished lengths but the mill extra for this was considered more than the loss from wastage in the factory.

It may not be generally known, but one of the quickest ways to cut brass tubing (and thin sheet brass) is by means of a "buzz saw," using a fine tooth saw, which is in reality a milling cutter of large diameter and very narrow face. The ordinary saw bench of the carpenter shop may be used for the work if there is no other, while saw tables made for printers' uses are admirably adapted to soft metal cutting. In the case now being discussed there was an unused special machine in the shop having an overhead mandrel and a sliding table moved by a hand lever. This is shown in the illustration, which also shows the strips that were fastened to the face of the table to act as guides for the tubes on both sides of the saw as they were cut.

The stock lengths were so long that it took as much time to put the tubes in the machine as to cut them up. To expedite matters a boy opened the boxes and piled the tubes on a table within easy reach of the man doing the sawing, who then had only to move each piece a few inches, slide it in the guides, and cut. Obviously hand feeding was the quickest way of bringing the tube up against the stop each time. After a dozen boxes of tubes had been cut up the man doing the work proposed a scheme that reduced the waste 75 per cent., without retarding production.



MULTIPLE GAGE FOR ELIMINATING WASTE

The $\frac{3}{4}$-in. rod, which hitherto had carried an adjustable stop, carries a multiple stop made of cast iron with four sliding pieces corresponding to the four lengths to be cut. These pieces are a close sliding fit as to stock length but may be pushed in and out with a touch of the finger and are kept from jarring out by a light spring on each.

Besides having all four lengths instantly available there is the stock saving feature, which is employed as follows. Suppose that 24-in. tubes are being cut and that the 24-in. slide is out, as shown. There is a board to the right of the workman on which he rests each tube as he picks it from the stock pile and on this board, about 4 ft. from the saw, are several notches which he learns to know. When a number of pieces have been sawed off from the tube the free end approaches these notches, which point the workman is watching, and he knows from its position about how many pieces of certain length are still in the tube. If, for instance, there is a scant 44 in. left in the piece, it would make one 24-in. length and the entire remainder would be waste because even the thickness of the saw cut would make it too short for a 20-in. piece.

Instead the workman shoves out the 23-in. slide, cuts off one piece, pushes back the 23- and out the 20-in. slide and cuts a second piece with only $\frac{1}{2}$ in. waste. When the next tube is put in the machine he goes back to the 24-in. length. Working all day on 24's, he has a dozen kegs of them by night and one keg each of the three other lengths. Though seemingly complicated, this process is so simple in practice that an ordinary man "catches on" at once—and the saving is a considerable item.

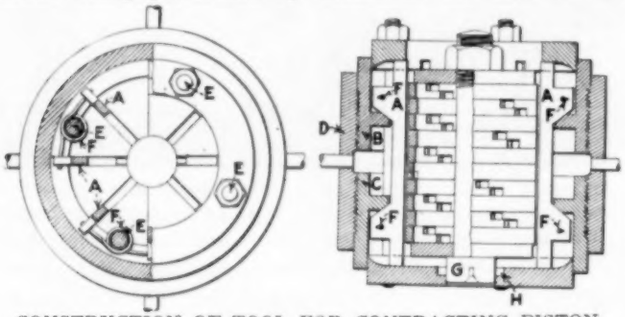
## Gas Engine Piston-Ring Contracting Device

BY C. D. SIMPSON

The drawing shows a jig for contracting gas-engine piston rings preparatory to grinding them.

The jig consists of eight slides *A*, which are constrained to move in a radial direction by slots cut in the two end plates, and these slides are given a radial movement by means of the two rings *B* and *C*, which bear at an angle on the rear of the slides. The rings *B* and *C*, threaded right- and left-hand, are caused to

approach or recede from each other by the rotation of the threaded ring *D*. The jig is held together by four distance bolts *E*, around which at top and bottom are placed the springs *F*, whose function it is to return the blades to their original position. The rings *B* and *C* are cut out where the distance bolts *E* pass through them, thus constraining the rings to recede or approach them. In use the jig is opened to its fullest extent, and the arbor *G* with its bottom plate is placed in the jig, the arbor being positioned by means of the hole in the




CONSTRUCTION OF TOOL FOR CONTRACTING PISTON RINGS

end plate. The piston rings to be ground are then placed in the jig, together with the arbor top plate, and the ring *D* is rotated. This rotation of *D*, by means of the rings *B* and *C*, as above explained, causes the blades *A* to move toward the center and contract the piston rings. The arbor nut is then screwed up, rotation between it and the arbor being prevented by the pin *H*. The ring *D* is then rotated in an opposite direction and the piston rings on the arbor lifted out, ready for grinding the external surfaces.

This device is in service at the shops of the Boise Machine and Welding Works, Boise, Idaho.

## Spacing Jig for Slot Holes

BY HARRY MOORE

The sketch shows a novel idea for drilling two holes, close to each other, through one bushing. The work shown in Fig. 1 is a valve stem with a keyway and a slot. The length of the slot is twice the diameter of the holes, necessitating the holes being drilled close to each other, the remaining metal to be punched out.

FIG. 1

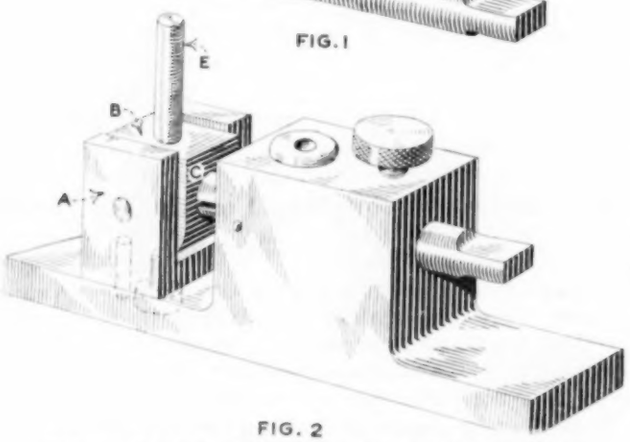



FIG. 2

FIG. 1. VALVE STEM WITH KEYWAY AND SLOT
FIG. 2. JIG WITH WORK INSERTED IN POSITION TO DRILL FIRST HOLE

The jig, Fig. 2, is of simple design, being bored to take the work. It has a drill bushing and a thumbscrew to hold the work in place, a pin at the side engaging in the keyway. Part *A* is screwed and dowelled to the jig base, and is slotted to take part *B*, which swivels on a pin through *A*. Part *B* is of such dimensions on the working faces *C* and *D* that after the first hole is drilled face *C* and on the face opposite the one carrying the handle *E*, that after the first hole is drilled the face opposite *E* is brought into contact with the work, locating it in the proper place for the second hole.

The jig is quick in action. After the thumbscrew is loosened, the locating forces are brought into contact by means of the handle *E*.

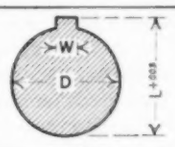
## Dimensioning of Keyways

BY A. B. WELLS

On page 82 of the *American Machinist* there was published an article under the above title by Hans Ernst. In copying the table accompanying the article several mistakes were found.

As the height of a key above the shaft is one-half its

$$L = \sqrt{\left(\frac{D}{2}\right)^2 - \left(\frac{W}{2}\right)^2} + \frac{W}{2} + \frac{D}{2} + 0.005$$




Diameter of Shaft D

| W | 1/16 | 3/32 | 1/8 | 5/32 | 3/16 | 7/32 | 1/4 | 9/32 | 5/16 | 3/8 | 7/16 | 1/2 | 9/16 | 5/8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KEY | 1 | 2,4 | 3,5,7 | 6,8,10 | 9,11,13 | 12,14 | A,15,16 | 17,18 | B,C,D,23 | 25,26 | E,F,G, | 29,31,30 | U,31 | V,32 | 33 | 34 |
| 1/16 | 0.345 | | | | | | | | | | | | | | | |
| 3/32 | 0.409 | 0.421 | | | | | | | | | | | | | | |
| 1/8 | 0.472 | 0.484 | | | | | | | | | | | | | | |
| 5/32 | 0.534 | 0.547 | 0.560 | | | | | | | | | | | | | |
| 3/16 | | 0.610 | 0.623 | | | | | | | | | | | | | |
| 7/32 | | 0.673 | 0.686 | 0.698 | | | | | | | | | | | | |
| 1/4 | | 0.736 | 0.749 | 0.762 | | | | | | | | | | | | |
| 9/32 | | 0.799 | 0.812 | 0.825 | 0.837 | | | | | | | | | | | |
| 5/16 | | | 0.875 | 0.888 | 0.900 | | | | | | | | | | | |
| 3/8 | | | 0.938 | 0.951 | 0.964 | 0.976 | | | | | | | | | | |
| 7/16 | | | 1.001 | 1.014 | 1.027 | 1.039 | | | | | | | | | | |
| 1/2 | | | | 1.076 | 1.090 | 1.102 | 1.114 | | | | | | | | | |
| 9/16 | | | | 1.140 | 1.153 | 1.165 | 1.178 | | | | | | | | | |
| 5/8 | | | | 1.203 | 1.216 | 1.229 | 1.241 | | | | | | | | | |
| 11/16 | | | | 1.265 | 1.279 | 1.292 | 1.304 | | | | | | | | | |
| 3/4 | | | | | 1.342 | 1.355 | 1.367 | | | | | | | | | |
| 13/16 | | | | | 1.405 | 1.417 | 1.430 | 1.455 | | | | | | | | |
| 7/8 | | | | | 1.467 | 1.481 | 1.494 | 1.518 | | | | | | | | |
| 15/16 | | | | | 1.530 | 1.544 | 1.557 | 1.582 | | | | | | | | |
| 1 | | | | | | 1.606 | 1.620 | 1.645 | 1.669 | | | | | | | |
| 1 1/16 | | | | | | 1.669 | 1.682 | 1.708 | 1.732 | | | | | | | |
| 1 1/8 | | | | | | 1.732 | 1.745 | 1.771 | 1.795 | | | | | | | |
| 1 3/16 | | | | | | 1.795 | 1.808 | 1.834 | 1.859 | | | | | | | |
| 1 1/4 | | | | | | 1.858 | 1.871 | 1.897 | 1.922 | 1.946 | | | | | | |
| 1 5/16 | | | | | | | 1.934 | 1.960 | 1.985 | 2.009 | | | | | | |
| 1 3/8 | | | | | | | 1.997 | 2.023 | 2.049 | 2.075 | | | | | | |
| 1 7/16 | | | | | | | 2.059 | 2.086 | 2.112 | 2.137 | | | | | | |
| 1 1/2 | | | | | | | 2.122 | 2.149 | 2.175 | 2.200 | 2.223 | | | | | |
| 1 9/16 | | | | | | | 2.375 | 2.400 | 2.427 | 2.452 | 2.477 | 2.501 | | | | |
| 1 5/8 | | | | | | | 2.624 | 2.651 | 2.678 | 2.704 | 2.730 | 2.754 | | | | |
| 3 | | | | | | | | | 3.181 | 3.208 | 3.234 | 3.260 | 3.285 | | | |

CORRECTED TABLE OF INTERNAL KEYWAY DIMENSIONS

width, the difference between the dimension *L* for a 1-in. shaft with a 1/16-in. key and the same size shaft with a 3/32-in. key can not be greater than 0.0156 in. In Mr. Ernst's table the difference given is 0.032 in.

I am sending you a copy I made from Mr. Ernst's table in which the mistakes found have been corrected and are inclosed in the squares with heavy lines.

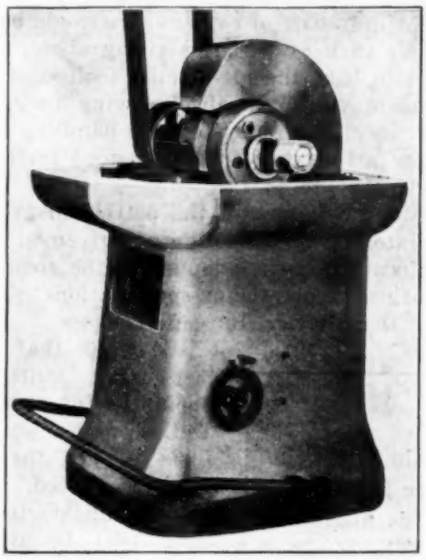
## Machine Beds Made of Ferro-Concrete

SPECIAL CORRESPONDENCE

The development of the cement gun process, by means of which layers of concrete can be applied in any desired shape, level or curved, without molds, has in-

spired a German engineering firm with the idea of using beds for machine tools and other machines, such beds made of ferro-concrete as a substitute for those made of cast iron.

The illustration shows the base of a tool grinding machine made of ferro-concrete, which is the first sample of this work. This machine was built for the



TOOL GRINDING-MACHINE WITH FERRO-CONCRETE BASE

Minimax Fire Extinguisher Co. and has been in continuous use for three years with satisfactory results. The ferro-concrete shows no cracks or fissures, which is believed to be proof of its being fully qualified for this purpose.

The process of making machine bases of ferro-concrete is simple. A wire skeleton is first erected, shaped to design, and the hollow part within is shuttered off by wooden boards. Concrete is then applied in two or three layers by means of a cement gun. Machine parts like bearings, bushes, etc., are inserted in the proper places and fixed to the wire skeleton before applying the concrete.

The field of application of this process is, of course, limited. A machine built in this way cannot be moved, which is a considerable disadvantage. For heavy planers with long beds this process seems, however, to be quite suitable. The practical use of the process has so far been very limited as it is only a side line of the extensive application of the cement gun in engineering construction.

The matter has, however, now been taken in hand by a combine of several leading engineering firms and it is intended to propagate the use of ferro-concrete in machine building as far as possible, on account of the high price and shortage of iron.

## Cut-Off Tools for Brown & Sharpe Automatics

BY FRANK E. WILDER

The draftsman is frequently called upon to design circular cutting-off tools for Brown & Sharpe automatics and in most cases he knows but mighty little about the subject. How thick and how long should he make the blade, and what should be the cutting angle of the point? How can he know these things when there is so very little reliable information to be found?

Regarding the cutting angle of the point, the Brown & Sharpe practice can be found in some of the handbooks and for special tools made for one specific purposes it is best to follow that and use a cutting angle varying from 10 deg. for drill rod to 23 deg. for brass, but for all general purposes an angle of 15 to 18 deg. will answer.

The best thickness of the blade is not so easily determined. For economy of stock, it should be as thin as possible consistent with sufficient strength, but on the other hand there must be thickness and body enough to resist deformation in the hardening process and to carry away the heat generated by the cut.

Usually the matter is decided empirically with the result that the work of different draftsmen will vary considerably according to the experience and ideas (or lack of them) of the individual.

The only formula that has been floating around within the writer's knowledge is one that has a stern and haughty look to it, and besides, it gives results that are unnecessarily large, especially for the smaller diameters of work. Referring to the notation below, in its original form it looks like this: $t = \sqrt{\frac{d \cot \alpha}{3}} \times 0.14$. This is discouraging at the outset, but it can be reduced to a little better shape like this: $t = 0.081 \sqrt{d \cot \alpha}$, but even in this form it involves an amount of work for which the average draftsman has but little stomach, and it is a good deal easier to make a guess at it than to wade through that square root.

The accompanying formulas and table represent the regular practice of a concern operating a large number of Brown & Sharpe automatics. The whole thing is so simple and easily applied that it might well find a place in the note book of every screw machine man, especially as it gives results that are thin enough and thick enough and theoretically all right.

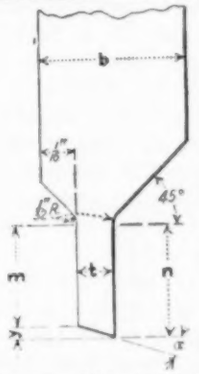
FORMULAS AND TABLE FOR CIRCULAR CUT-OFF TOOLS FOR BROWN & SHARPE AUTOMATICS

NOTATION:

$d$ = Diameter of work
$b$ = Thickness of cutter
$t$ = Thickness of cut-off blade
$m$ = Back length of blade
$n$ = Whole length of blade
$\alpha$ = Cutting angle
$y$ = Angular rise

FORMULAS

$t$ = 0.16d
$m$ = 0.7d
$n$ = m + y
$\alpha$ = 18 deg. for average work
$y$ = T tana




NOTE.—The value of $t$ can be expressed in this way: Make the blade 0.010 thick for every one-sixteenth of work diameter. The value of $y$ is taken for $\alpha$ equals 18°. The tabulated sizes are sufficient for all practical purposes and the Remarks column gives the range of stock sizes for which each cutter is well adapted.

| Machine Size | $d$ | $t$ | $y$ | $m$ | $n$ | Remarks |
|---|---|---|---|---|---|---|
| No. 00 | $\frac{1}{16}$ | 0.035 | 0.011 | 0.153 | 0.164 | Brass up to $\frac{1}{4}$ diam. |
| | $\frac{1}{4}$ | 0.040 | 0.013 | 0.175 | 0.188 | Brass $\frac{1}{4}$ to $\frac{5}{16}$ diam. |
| | | | | | | Screw stock up to $\frac{1}{4}$ diam. |
| | $\frac{5}{16}$ | 0.050 | 0.016 | 0.219 | 0.235 | Screw stock $\frac{1}{16}$ to $\frac{5}{16}$ diam. |
| No. 0 | $\frac{1}{4}$ | 0.060 | 0.020 | 0.263 | 0.283 | Brass up to $\frac{1}{4}$ diam. |
| | | | | | | Screw stock up to $\frac{1}{4}$ diam. |
| | $\frac{1}{4}$ | 0.080 | 0.026 | 0.350 | 0.376 | Screw stock $\frac{5}{16}$ to $\frac{1}{4}$ diam. |
| No. 2 | $\frac{1}{4}$ | 0.080 | 0.026 | 0.350 | 0.376 | Brass up to $\frac{11}{32}$ diam. |
| | $\frac{11}{32}$ | 0.100 | 0.032 | 0.438 | 0.470 | Brass up to $\frac{1}{2}$ diam. |
| | | | | | | Screw stock $\frac{1}{4}$ to $\frac{11}{32}$ diam. |
| | $\frac{1}{2}$ | 0.120 | 0.039 | 0.525 | 0.564 | Screw stock $\frac{1}{4}$ to $\frac{1}{2}$ diam. |

# IN THIS ISSUE

THE Bryant No. 40 form-grinding machine furnishes the subject matter for our leading article this week. The machine referred to uses wide-faced wheels, grinding "pieces 10 in. long and of any diameter up to 12 in. by feeding the wheel straight toward the center of the work with a traverse of only ¼ in." Sheldon has written a complete description from which the quotation was taken, a description few, of course, will pass by.

The second article, page 308, deals with operations on heavy sugar machinery. Examples of such operations are not so numerous that an article treating of them should be skipped. A further recommendation for this particular article is that it was written by Stanley.

In the tenth of his series about programs of apprenticeship and special training in representative corporations, J. V. L. Morris takes up the apprentice course at the plant of the Bethlehem Shipbuilding Corporation, Quincy, Mass. Shipbuilding on a considerable scale is comparatively new in the United States, so that it must be peculiarly gratifying to many to learn that even now apprenticeship and systematic apprentice instruction are assuming importance in the shipbuilding industry. Subforemen at the Bethlehem plant are acting as instructors for the apprentices, not in a haphazard way, but after being themselves instructed. Says Morris: "The outstanding feature of the newer apprenticeship program is the provision for special training for the sub-foremen under whom the apprentices are employed for their practical work, and who are also to provide the supplementary school instruction. Sub-foremen who were considered most adaptable to the work of apprentice training were selected from the various crafts required in the yards and put through a rigorous course of instruction for the job of teaching their respective trades." That is going at it in the right way, it would seem. The article begins on page 310.

Another of Hunter's railroad articles begins on page 312. Once upon a time railroad shops were sadly lacking in efficient and economical systems of handling their small tools. A progressive spirit has caused them to realize the disadvantages of such deficiency and, as Hunter says, "Many of our railroad shops no longer have the hit or miss sort of toolrooms." If all of them were strictly up-to-date of course there would be no need for an article such as we are writing about. But for those that still have the hit or miss toolrooms, and for industrial plants that are always going to get at the business of working up a system for handling tools, but never do, the article will furnish a good reminder and a good starting point.

Specifications for some of the petroleum products of immediate interest to our readers are given on page 314. These specifications were adopted by the committee on standardization of petroleum specifications of the Department of the Interior, Bureau of Mines.

## Coming Features

The first issue in March will contain an article by Associate Editor Hand who once in a great while manages to take time from his manifold editing duties to write something. The coming article deals with tools used in making phonograph tone arms, and Mr. Hand assures us that there are some very clever tools among those he describes.

"Industrial Research in the Art of Man Management" is the title of an article by Erwin H. Schell that we shall run next week. A high-sounding title, but don't misjudge the article because of that. There is a deal of good in it and there are other related articles to follow.

Of series articles there will be two — part IV of "The Foreman and His Job" and part V of "Metal Cutting Tools."

Hunter will furnish a railroad article on repairing air brake hose connections for railroad cars, there will be an automotive article by Colvin on the Ford frame, differential spider and differential gear case, and the liability for lack of ventilation will be discussed by Chesla Sherlock.

We think that we said, last week, quite enough about the fourth article by DeLeeuw on metal-cutting tools to get the average reader started. Having gotten him started we believe that he will finish without further urging, so that our mentioning it now is merely to call attention to the fact that the article referred to is concluded in this issue. Page 316.

It's rather difficult to exhaust the possibilities of the Ford, on the straightaway, on hills, or in a literary way. As special correspondence this week we have a short but very worthy article on sheet-metal body work, which deals with operations involved in making metal bodies for Ford cars. Page 318.

Another short article, beginning on page 319, deserves mention in passing because it records some of the things that have been done and shows some of the possibilities in a field that is not generally considered as properly belonging to the realm of machinery. The title, "Movie Records of Machinery," indicates the intent of our remarks.

What a wonderful word is "patent." It has meant riches to some and poverty to others and it has no doubt at some time or other misled all of us. Its companion word, though one much less misunderstood, is invention. Emanuel Scheyer attempts to set all of us straight once again by telling us what's so and what isn't about patents and inventions; page 321.

Sheldon's second article on magnetic chucks is concluded this week, beginning on page 324. Another article by Stanley appears on page 332. It tells how the valves in motor heads of the Holt tractor are ground in.

# EDITORIALS

## Sane Retrenchment

THE pendulum is swinging back. After five years of increasing expenditures and extravagance we are struggling to economize at every possible point and, as usual, are overdoing it.

Inflation is easy and can be accomplished on the spur of the moment without any great amount of mature deliberation, but deflation is quite another matter. It would be quite possible to lop ten or twenty or forty per cent from all appropriations but it would be a most unwise thing to do. At this time the activities of each administrative department and branch should be carefully scrutinized to determine their value to the economic life of the country. Those that contribute little or nothing to our advancement should suffer at the expense of the useful ones.

According to statisticians something over ninety cents of our tax dollar goes to the maintenance of our military and naval establishments. Obviously a relatively small proportional reduction in this direction would save far more than a much larger proportional one in all the other departments put together. In making these reductions it goes without saying that nothing should be done to weaken our defenses against possible aggression. It is claimed by many that we cannot cut down military and naval appropriations without weakening the two services seriously, but those of us who were in the service or had war-time contracts have had sad experience to prove that many retrenchments could be effected that would help efficiency rather than hinder it.

Among naval experts a controversy is raging over the efficacy of the dreadnaught and yet we seem to be committed to a very expensive building program consisting mostly of such craft. There can be little doubt that the next war will see far greater development of aerial, submarine and chemical warfare than has yet been dreamed of, in which case the nation that centers its defense in first-line battleships without adequate preparation in other directions will fare badly. Yet Congress has seen fit to strike out the appropriation for the air mail service which is really our experimental laboratory for aeronautic development.

Two divisions of the military establishment appeal to us as worthy of the heartiest support and encouragement, the engineering and research stations such as Aberdeen and McCook Field, and the arsenals such as Watertown and Edgewood and the Naval Gun Factory. They should be equipped with the finest up-to-date machinery and their personnel should be the best the service can assign. In the second division we would include the government nitrate plant partly because of its vital necessity in time of war, but also because it can pay its way in peace times by producing commercially useful products. First cost is high but a return on the investment is sure, while the investment in capital ships must be written off in a few years because of obsolescence.

We believe implicitly in preparedness and particularly in industrial preparedness, but there is much that is unnecessary in our present military and naval estimates. Sane retrenchment should be our aim.

## Getting Men and Jobs Together

THE shortage of labor during the war caused the establishment of the United States Employment Service, to regulate and conserve the labor supply. Although handicapped by bureaucratic methods and both personal and political jealousies, it performed a signal service in distributing labor to much better advantage than ever before.

In spite of the strenuous efforts of its friends, political and business enemies succeeded in having the service discontinued at a time when it was becoming increasingly necessary. It would be particularly valuable at a time like this when there is much unemployment which might be avoided if the work and the men could be brought together.

An agency that can bring unemployed men to jobs which they can fill is certainly to be desired. We have talked much about square pegs in round holes, but even this is better than no holes at all, in times of depression. For unemployment is not only the most disheartening, it is the most dangerous thing that can happen either to individuals or to a country.

The unemployed man with a family dependent on him, is in no condition to weigh fine points of ethics or of economics. No question is of greater importance than that of steady employment, of sorting men and jobs into a fairly satisfactory relationship. A clearing house which will help to do this, as did the Employment Service, is a necessity at all times. It is not an expense but an asset.

## Good Outlook for Oil-Well Tools

ONE of the great advantages which the United States has over most other countries is the great diversity of resources and industries within its own borders. This has a good effect in steadying fluctuations of trade and in helping to smooth out the present low spots in general business.

Perhaps one of the busiest industries at present is that of oil. Old wells are being kept at work and new ones are constantly being drilled. The demand for drilling heads or bits is great enough to cause the makers of such tools to greatly enlarge their facilities as indicated by the following extract from a letter recently received from a well known builder of oil-well tools.

"I am glad to be able to say that everything is going well with us, the last year having been a particularly good one; and we look forward to 1921 as our Banner Year. We have had wonderful success in California, and believe that our business for 1921 will be about double that of 1920."

These shops use machine tools in larger quantities than we have imagined, although the equipment is small as compared with builders of motors and similar machinery. But oil-well equipment is still in demand and some of it is going to be built on new machinery. If you have been thinking of oil-well tools as being made in a country blacksmith shop it may pay to investigate the possibilities of selling machinery to the makers of these interesting contrivances.

# Industrial Waste*

## Weaknesses in Our Production System — National Progress Depends Upon Continuous Improvement in Production—Causes of Industrial Waste

By Herbert Hoover
President, American Engineering Council

THE Federation of Engineering Societies has been brought about solely that we might secure for public service the collective thought and influence of 100,000 to 200,000 of our professional engineers. This great body of men in administrative and technical service penetrates every industrial avenue and thus possesses a unique understanding of many of our intricate economic problems and an influence in their solution not equalled by any other part of the community. Wanting nothing from the public either individually or as a group, they are indeed in a position of disinterested service. This Federation has initiated services to the public in many directions.

I propose to deal with only one measure of this service today. Your Council has organized a preliminary survey of some of the weaknesses in our production system. This survey will attempt to visualize the nation as a single industrial organism and to examine its efficiency toward its only real objective—the maximum production. In a general way this inquiry will bear upon the whole question of deficiency in production—industrial waste in a broad sense.

### Causes of Under-Production

The waste in our production is measured by the unemployment, the lost time due to labor conflict, the losses in labor turnover, the failure to secure maximum production of the individual due either to misfit or lack of interest. Beyond this again is a wide area of waste in the poor co-ordination of great industries, the failures in transportation, coal and power supplies which re-echo daily to interrupt the steady operation of industry. There are again such other wastes due to lack of standardization, to speculation, to mismanagement, to inefficient national equipment and a hundred other causes. There is a certain proof of deficient production by comparisons of our intense results in 1918, when, with 20 per cent of our man-power withdrawn into the army, we yet produced 20 per cent more commodities than we are doing today. We are probably not producing more than 60 or 70 per cent of our capacity; that is, if we could synchronize all national effort to maximum production, we could produce 30 or 40 per cent more commodities and service. Our national machine is today doing worse than usual, as witness the 3,000,000 idle men walking our streets. One part of the human measure of this shortage in production is the lack of necessities or comforts to them and their families, and their anxieties as to the future.

No one will ever suppose that it is ever possible to bring national productivity up to the full 100 per cent, but the whole basis of national progress, of an increased standard of living, of better human relations, indeed of the advancement of civilization, depends upon the continuous improvement in productivity. While we currently assume that great advances in living standards are brought about by new and basic invention, yet in fact even a greater field of increasing standards lies in the steady elimination of these wastes. The primary duty of organized society is to enlarge the lives and increase the standards of living of all the people—not of any special class whatever. We are therefore proposing to make a preliminary examination of the volume of waste in certain industries, the proportions that lie in each field of fault. And no engineering report is worth the paper it is written upon without constructive suggestions in remedy.

### Production and Over-Supply

There is oftimes a superficial dismissal of this subject of maximum production on the assumption that there are positive limits in production due to oversupply. Such assumption has no proper foundation in the broad view of industry as a whole. Too much economic thought on production has delimited its boundaries by the immediate volume of demand of a given commodity. There is no such thing as the nation overproducing, if it produces the right commodities. The commodities or services produced by the whole nation are capable of absorption by the whole nation if they are of the right character. In other words, if we could attune the whole industrial machine to the highest pitch, agriculture as well as manufacture, an increasing production would mean a directly increasing standard of living. When ten men or one hundred million men divide their united output, they can by doubling their output have twice the amount to divide. The problem in doubling output is to direct it to commodities or services that they can use. There is no limit to the increase of living standards except the limitations of human strain, scientific discovery, mechanical invention and natural resources.

It is true enough that any particular commodity or service can be over-produced, for each will reach a saturation point in demand when all the members of the community have been supplied. The absorption of increased productivity lies in the conversion of luxuries of today into necessities of to-morrow, and to spread those through the whole population by stimulation of habit and education. Wheat bread, railways, good roads, electricity, telephones, telegraphs, automobiles and movies were once luxuries. They are still luxuries to some parts of the population.

It is but a corollary that certain commodities can better be produced for exchange for commodities from outside our boundaries of more appropriate character to our needs. To-day we have capacity for production of some commodities not only in excess of our home need, but even beyond export demand under present financial conditions. As a matter of practical remedy, we must either reorganize these financial relations or alternately abandon some part of this kind of production and turn our idle men to making things of which we are not yet fully supplied.

To put the matter in another way, there is no limi

*Address delivered before American Engineering Council's Executive Board and Convention of Engineers at Syracuse, N. Y., Feb. 14, 1921.

to consumption except the total capacity to produce, provided the surplus of productive power is constantly shifted to new articles from those that have reached the saturation point of demand. For instance, we have the productive capacity wasted today that would improve the housing conditions of our entire people to the level that perhaps only 50 per cent of them enjoy—and at the same time not entrench upon our established necessities. I am not suggesting that the forces of production can be shifted by imperial direction. The practical thing that can be done is to eliminate some of the wastes and misfits in our production, and depend upon the normal processes of business and human desires to absorb them.

### Stabilized Production

The largest area of waste lies in the large periods of slack production and unemployment, due to the ebb and flow of economic tides between booms and slumps. The ideal would be steadily increasing production—an ideal of no likelihood of exact realization because of inability to ever gage the advance in growth consumption or the approach of saturation. On the other hand, there are certain possibilities of stabilization worth consideration. For instance, we can classify labor into that engaged in production and service from this equipment. Our studies of industries as a whole show that we usually expand our equipment just at the periods of maximum demand for their products instead of doing our plant expansion during periods of slack consumption. We thus make double demands on labor and we doubly increase unemployment in periods of reduced consumption. That is indeed one of the factors in our great unemployment today. Everyone knows that for our normal productivity, our transportation facilities are today inadequate. We know that we are insufficiently housed, insufficiently equipped in our public roads and our public utilities; that we need an entire revision of our power supply, that we need expansion of our water ways, and yet armies of idle men are walking the streets. The reasons why this occurs are not far to seek, in that it is at times of high productivity that capital is most easily obtained. It is then that the necessity of increased equipment most impresses men's minds and it is the high hopes of these periods that lead them into the adventure of expansion. Nor is it possible to expect that all industry could be so stabilized as to do its capital construction in periods of depression in commodity demand. Nevertheless, there are some industries that could, by co-operation of the government and co-operation amongst themselves, be led in this direction. More particularly does this apply to railways, telephones, telegraphs, power supplies and other public utilities, and to the expenditure upon our state, municipal and national public works.

Another variety of intermittent employment, and thus great waste, lies in certain industries now operating upon an unnecessarily wide seasonal fluctuation, as for instance the bituminous coal industry. This is today one of our worst functioning industries. These mines operate seasonally and erractically. They proceed from gluts to famines, from profiteering to bankruptcy. As already determined by our engineering bodies, the men who mine our coal find work only 70 per cent of their time. In other words, there are 30 per cent more equipment, 30 per cent more men, attached to this industry than are necessary if it were stabilized to continuous operation. The mining engineers have already pointed out the directions in which remedy lies, through storage, through railway rate differentials and other remedies. Through constructive action, an army of men could be released from this industry of necessity to convert some luxury into a necessity of tomorrow. This is no plan to control prices or profits, although through it both the producer and consumer in coal could be placed upon a sounder basis than today. The interest of the consumer and producer, is, however, even less important than relief from the intermittent employment and unemployment within this industry that today bring a train of indefinite human misery and some of our lowest standards of living.

The second largest area of waste in productivity is the eternal amount of labor friction, strikes and lockouts. The varied social and economic forces involved in this problem need no repetition here. Fundamentally this is not alone a struggle for division of the results of production between capital and labor, but there is also a loss greater from strikes and lockouts in the element of purely human friction and loss outside the area of dispute on wages and hours. The growth of industry into large units has destroyed the old mutuality of interest between employee and employer. Our repetitive processes have tended to destroy the creative instinct and interest in employees; at times their efforts sink to low levels indeed. We will yet have to reorganize the whole employment relationship to find its solution. There is great promise in this field during the past two years, and the progress in this matter is one of the subjects under our inquiry.

Yet another variety of loss lies in the unnecessarily faulty distribution of our labor supply due to seasonal and to shifting demands. An adequate national employment service is indeed the first need to reduction of those wastes.

### Need of Standardization

Probably the next largest fraction of waste in productivity lies in a too high degree of individualism in certain basic products and tools. In other words, a standardization of certain national utensils makes for economy in distribution, in operation and in repairs. The necessity of maximum production during the war opened a great vista of possibilities in this direction. Such standardization as car couplings, or wheels, and cars generally, represents real progress in this direction. These possibilities lie in a hundred directions. There are all sorts of cases from sizes of chains to the size of automobile wheels. Today dozens of different sizes are placed in the market by manufacturers and entail not only special equipment and skill to produce those many varieties, but also great stocks are required in distribution and losses are entailed due to lack of interchangeability. It is certain that there are a great many articles of every day use in which the manufacturer would indeed be glad to undertake some co-operation in standardization, from which the saving in national effort would be interpreted not into millions but into billions of dollars. This does not mean that we stamp the individuality out of manufacture or invention or decoration; it means basic sizes to common and everyday things.

Another type of waste lies in our failure to advance

our industrial equipment. The Super-Power Board will demonstrate the saving of 25,000,000 to 50,000,000 tons of coal annually by the electrification of our eastern power supply. The St. Lawrence Waterway Commission will demonstrate the saving of five to ten cents a bushel to the farmers of fifteen states by unlocking the lakes to ocean going vessels.

Nor will this added efficiency to our national transport injure our present systems of canals and waterways, for we have ever found that the prosperity of an industry blesses them all.

### Co-operation Solves Many Things

Nor do we believe it is necessary to effect these things by the government. The spirit of co-operation that has been growing in our country during the last thirty years has already solved many things; it has standardized some things and is ripe for initiative toward co-operation of a wide-spread character. The leadership of our Federal government in bringing together the forces is needed. No greater field of service exists than the stimulation of such co-operation. The first step is sane analysis of weakness and sober proposal of remedy. If the facts can be established to an intelligent people such as ours, action is certain even if it be slow. Our engineers are in unique position for this service, and it is your obligation to carry it forward.

## How To Get Back to Normal

By C. E. Knoeppel

*Do you want to get back to normal quickly?*

This is the year of liquidation and readjustment in business.

The present condition can be best expressed as follows:

No selling, no buying;
No buying, no making;
No making, *then what?*

Falling sales, unemployment, idle plants, decreased production, high costs, and heavy losses, are elements in the present situation, and can only result in one thing—*depression and business stagnation*—unless constructive steps are taken to get back to normal *quickly*.

There should be plenty of business ahead. Our children need schools; our families need homes to live in; our cities require new public buildings; our automobiles, trucks and farmers need roads; our railroads need repairs and new tracks, roadbeds and equipment; our public utilities need betterments and replacements; our furnaces and stoves require fuel; our people need shoes and clothing. In addition to all of this, *the world needs food.*

### A Constructive Program

Here is a constructive program based on years of experience in industry, which will mean results to you:

(1) Determine normal capacity of machines, working places, departments and plants, in hours. This may be 75 to 85 per cent of your possible capacity.

(2) Standardize overheads according to departments, with due consideration to reductions in same, determining what these overhead rates would be for your normal capacity.

(3) Determine from estimates, records of past performances, by conferences or by observations, what would be fair and attainable production standards per hour for your various operations, using your normal capacity as a basis. *Do this for the reason that productivity* (relative amount produced per hour) *is the gage of economy and efficiency in manufacturing.*

(4) This will enable you to determine various combinations of the standard quantities of the various products you can make.

(5) Using current prices for labor and material, and your standardized overhead rates, the cost of these products, at normal capacity can be determined.

(6) A fair and reasonable profit added to costs—or using costs for a time, if you have to—will mean prices which will bring business, *because greatest volume of work goes to that concern whose prices reflect normal operating conditions.*

(7) Now call in some of your best workers as representatives of their fellow workmen, and outline to them what your present conditions are and what you want to do, explaining the above points, especially number (3), as they relate to unemployment, reduction in wages or hours, and company losses.

(8) Place these plans before your banks, as a basis for credits and financial help.

(9) At the same time, get your sales and advertising campaigns tuned up with the above, giving due consideration to time payments, discounts and the like.

(10) Charge the differences between actual and standard overhead costs into an adjustment account for the time being, which will decrease as you approach normal capacity, and which will cease when you reach normal. *This loss will be much less for the coming year than it would otherwise be as plants are now operating.* As you go above normal and reach possible productions, this loss would be offset in whole or in part by credits to the adjustment account.

The balance, loss or gain, at the end of the year, would be carried into profit and loss.

### Not Mere Theory

The above is not mere theory. The steps have been tried and proven out and *are practical and workable.* They have been used by plants before the war and since the war.

Anticipating normal conditions will mean normal conditions more quickly.

## High-Speed Tapping

By F. C. Mason

As I have never seen any production records of tapping operations I thought the following record would be of interest.

The work was tractor transmission cases, which weighed approximately 225 lb. There were twenty-four $\frac{5}{8}$-in. holes through metal $\frac{3}{4}$ in. thick, nineteen $\frac{1}{2}$-in. holes through metal $\frac{5}{8}$ in. thick, one $\frac{3}{4}$-in. iron pipe size and one other size I do not remember, making a total of forty-five holes to be tapped.

The case was held in a rotating jig under a radial drill and one operator with one helper, who assisted in handling the casting and oiled the taps, did the work. They finished fifty cases per eight-hour day, or 2,250 holes, an average of 281$\frac{1}{4}$ holes per hour.

The spindle speed used was 400 r.p.m., a peripheral speed of nearly 80 ft. per minute for a $\frac{3}{4}$-in. tap. The work had to be turned four times and the different sizes of taps used.

# SHOP EQUIPMENT NEWS

**SHOP EQUIPMENT • NEWS •**
A weekly review of modern designs and equipment

*Descriptions of shop equipment in this section constitute editorial service for which there is no charge. To be eligible for presentation, the article must not have been on the market more than six months and must not have been advertised in this or any previous issue. Owing to the news character of these descriptions it will be impossible to submit them to the manufacturer for approval.*

**• CONDENSED • CLIPPING INDEX**
A continuous record of modern designs and equipment

## Boston 12-Inch Rotary Surface-Grinding Machine

The Boston Scale & Machine Co., 100 Ruggles St., Boston 20, Mass., has recently placed on the market a 12-in. rotary-table surface-grinding machine, shown in Fig. 1. The maker states that the tool is adapted to production work, being intended to produce work both quickly and cheaply, and to give continuous service with but little liability of breakdown.

The means employed to impart reciprocating motion

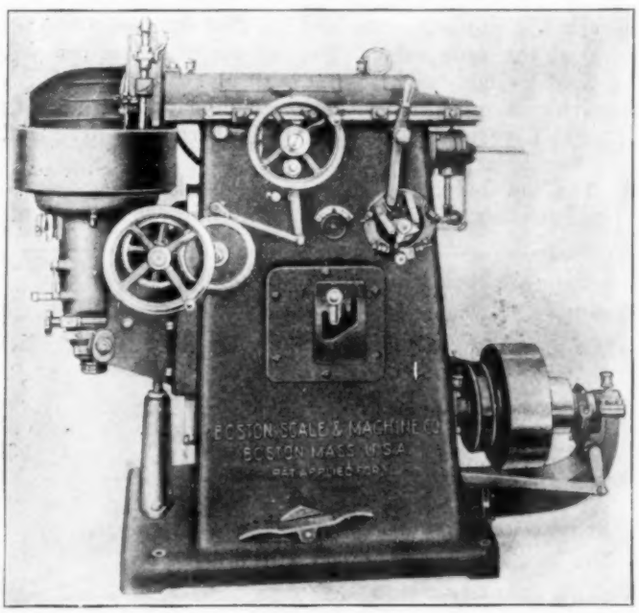



FIG. 1. BOSTON 12-INCH ROTARY-TABLE SURFACE-GRINDING MACHINE

to the head which carries the grinding-wheel spindle is worthy of notice. The motion is obtained by the use of oil flowing under pressure, the direction of flow being controlled by a balanced reversing mechanism. The motion is said to be smooth and even, being convertible instantly from the slowest to the fastest speed, and vice versa, or to any intermediate speed. There is no gearing or multiplicity of small parts to wear or to become deranged. It is stated that the machine may be used at a short stroke on a great number of similar pieces without producing unevenly worn parts, as in the case of a gear or worm-and-rack-driven reciprocating head.

A wide range of speed is provided for the reciprocating head, the minimum speed being one full stroke forward and return, or 17 in. in 10 minutes. This

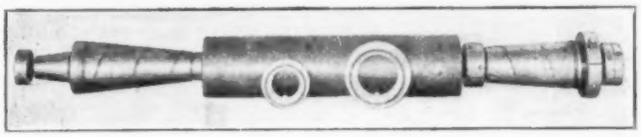


FIG. 2. GRINDING-WHEEL SPINDLE, SHOWING TAPER BEARINGS

speed can be converted instantly to the fastest speed of ten full strokes per minute or to any intermediate speed, the speed and the range being indicated on a sector mounted on the column.

The reversing mechanism is primarily a cylindrical rotary type of balanced valve. The pump which supplies power for operating the sliding head is also of rotary type and is capable of giving a pressure of 100 lb. per square inch. About 40 lb. per square inch is the working pressure, a relief valve set for 60 lb. being supplied. The oil used is designated as "white compressor oil" and is practically foamless.

The grinding spindle is provided with taper bearings of liberal dimensions at each end, as shown in Fig. 2. Readjustment for alignment and for wear of either bearing is made at the rear bearing, which is arranged to permit the making of close adjustments quickly. A hardened thrust bearing is provided to take the pressure of the backward stroke.

The machine is driven by a 4-in. belt on a 14-in. clutch pulley. The pedal for operating the clutch is placed conveniently for the operator. The driving shaft bearings are bronze bushed and made separate from the frame castings, for convenience in rebushing or for removing the driving shaft.

The four-speed cone change gears, shown in Fig. 3, and controlling the speed of the vertical spindle which carries the magnetic chuck, are inclosed in a gear box and so arranged that the gearing and shaft bearings are splash oiled, insuring constant lubrication and

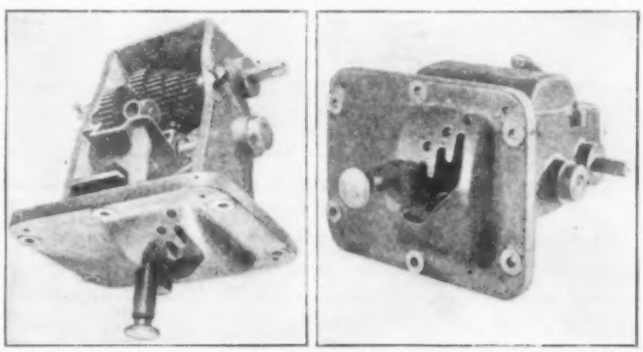


FIG. 3. CHANGE-GEAR BOX SHOWN OPEN AND CLOSED

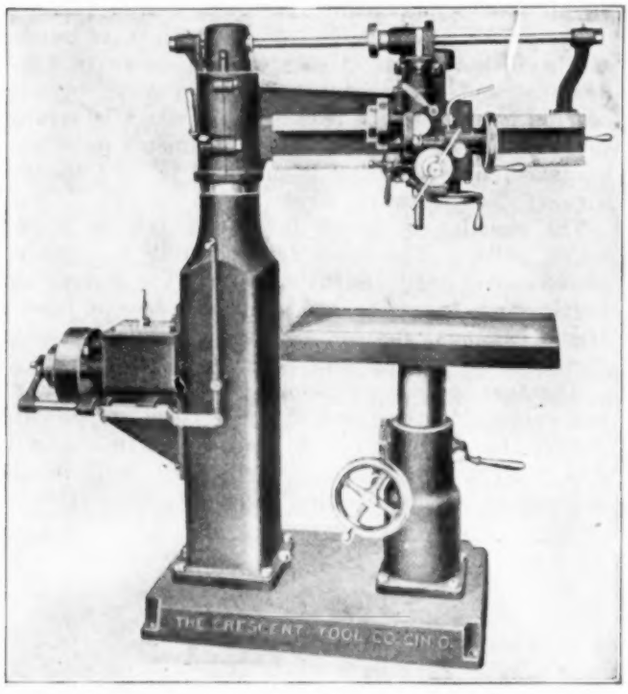
smooth running. This whole arrangement of gearing and gear box forms a unit, as shown at the right of the illustration, which unit can be readily removed as one piece. The automatic feed to the vertical spindle is positive, and ranges from 0.0025 to 0.005 in. by one-quarter thousandths. Means are provided to automatically throw out the feed at any desired point.

The chuck spindle has a wide-angle taper bearing at its upper end, to receive the thrust due to grinding and to assure a free-running bearing. The bottom bearing of the spindle is provided with an adjustment for wear. This spindle can be tilted 10 in. in either direction. The grinding and chuck spindles are each one-piece forgings and they, as well as the change gearing, are of heat-treated chrome-nickel steel.

The machine is arranged to carry a wheel 12 in. in diameter and having a face 1¼ in. or narrower, and it is furnished with a 12-in. circular magnetic chuck. It will grind the whole of a 13-in. disk. The sliding head can be set back, so as to grind a 6½-in. face on any disk up to 16 in. in diameter, provided that it can be held on the chuck supplied. A diameter of 17 in. can be swung inside the water pan. The machine weighs 2,800 lb. and takes up a floor space of 6 x 3 ft.

## Crescent 2½-Ft. Sensitive Radial Drilling Machine

The Crescent Tool Co., Second and Elm Sts., Cincinnati, Ohio, recently placed on the market a 2½-ft. sensitive radial drilling machine, a view of which is shown in the illustration. The machine, intended for high-speed, heavy-duty work, is entirely gear driven and can be furnished in two styles, one being equipped with hand feed only. The other, in addition to the hand feed, has two changes of power feed and also a quick return motion.




CRESCENT 2½-FT. SENSITIVE RADIAL DRILLING MACHINE

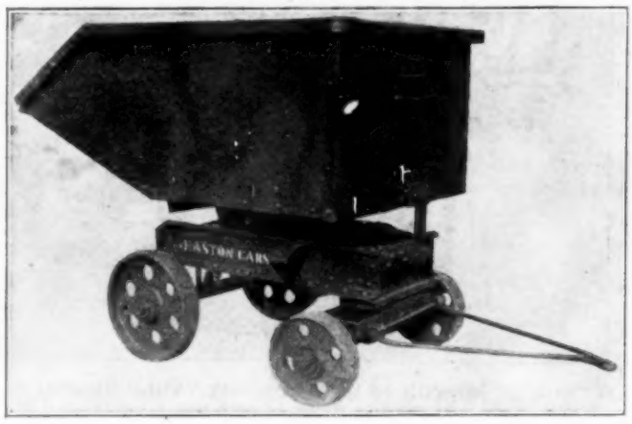
Specifications: Drills to center of 60-in. circle. Length from center of column to end of arm, 44 in. Minimum distance center of column to face of column, 3 in. Maximum distance end of spindle to base, 42 in. Minimum distance end of spindle to base, 35¾ in. Maximum distance end of spindle to table, 20 in. Vertical traverse of spindle, 6½ in. Drilling capacity, 1½ in. in diameter on steel. Size of table, 18x30 in. Vertical adjustment of table, 18 in. Size of base, 24x38x4 in. Driving pulley: size, 10x3 in.; speed, 550 r.p.m. Spindle speeds, 132 to 1,100 r.p.m. Spindle feeds, 0.0055 and 0.017 in. per revolution. Floor space, 26x72 in. Approximate weight: net, 1,200 lb.; crated, 1,300 lb.; boxed for export, 1,400 lb.

The machine is driven by a belt on a clutch pulley. It can be started or stopped instantly by a lever located at the front side of the column within easy reach of the operator. The variable-speed gear box provides six speeds in geometrical progression for the spindle, which makes from 130 to 1,100 revolutions per minute. The column and arm are of rectangular section. The arm is supported on steel balls and can be swung around the center of the column by a slight pressure. The head is rapidly moved on the arm by means of a rack and pinion, and a clamping device handy for the operator secures it tightly. The table is adjusted vertically by means of a handwheel, acting through a worm and wormwheel and a rack and pinion. It can be rigidly locked by a hand lever. All gears are made of steel with generated teeth, the gears in the speed box running partly in oil.

## Easton Scoop-Body Trailer Car

The Easton Car and Construction Co., 50 Church St., New York, N. Y., whose factory is at Easton, Pa., has recently put on the market a scoop-body trailer car. The capacity of the car is 27 cu.ft. The body is mounted on a structural-steel turntable which can be turned around in any direction and may be dumped from any one of the four sides. The wheels are equipped with roller-bearings. The front axle is of a swivel type and has a machined cast-iron ball-bearing around the kingbolt, permitting the car to be turned in practically its own length.

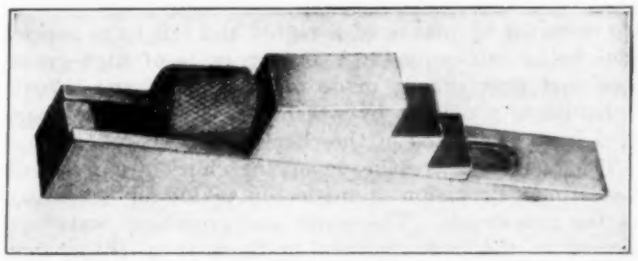
The low height of the car makes it convenient for hand loading. The car can be used for handling such materials as sand, coal, castings, cinders and metal-chips. It is equipped with "flat-tread" instead of narrow-gage-track wheels, not being confined to the limits of a track system. It can be handled by one man, where single cars, either hand pushed or pulled, can be employed.



EASTON SCOOP-BODY TRAILER CAR

## Hill Adjustable Size Block

A block of adjustable size and intended for use in setting cutting tools to height above a given surface is shown in the illustration. It is made by M. B. Hill, 10 Eden St., Worcester, Mass. The block is made of carbon steel, hardened and ground all over, and the sliding surfaces are lapped.

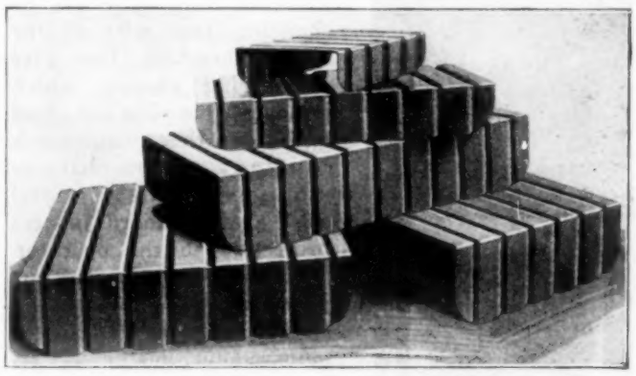


HILL ADJUSTABLE SIZE BLOCK

In the inclined surface of the larger piece is a T-slot, in which slides a small T-head stud that extends up into the hollow sliding block. A tapered hole in the upper end of this stud receives the correspondingly pointed end of the knurled-head screw in the block, a turn of which screw serves to clamp the latter in any position. The setting is, of course, measured by means of a micrometer over both blocks.

## Powell Pressed-Steel Lift-Truck Platforms

The Powell Pressed Steel Co., Hubbard, Ohio, has recently placed on the market pressed steel lift truck platforms, such as shown in the illustration. The platform is made of one piece of sheet steel and is formed by a cold process, which sets the material when pressed to the form required. This process is stated to give the platform more rigidity than if it were formed hot. The height, or inside clearance, of the platform is generally from 6½ to 12 in. The corrguations used to strengthen the platform are 1½ in. wide x ¾ in. deep and spaced at 6-in. centers. The size of platform that can be furnished is governed only by the size of the

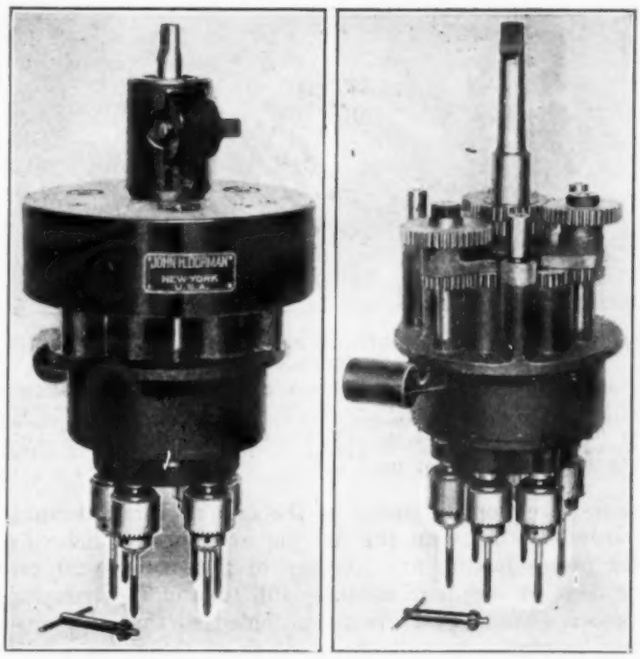


POWELL PRESSED-STEEL LIFT-TRUCK PLATFORMS

sheet or plate that can be purchased, and No. 7, 9, 10 or 12 gage material is generally used. It is stated that a platform made of No. 9 gage steel will easily carry from 15,000 to 20,000 lb., and may be overloaded considerably, that the life of a platform is practically endless, and that no repairs are required. Racks or boxes may be built onto the platform, and to provide a large flat top a sheet metal plate is spot-welded to the top of the platform.

## Dorman Multiple-Spindle Tapping Head

John H. Dorman & Son, 5148-52 Hudson Blvd. West, West New York, N. J., have recently brought out a tapping head of the sort shown in the illustration. It is intended for tapping simultaneously six holes grouped closely together, the holes not lying on the circumference of the same circle. The head at the left is com-




DORMAN MULTIPLE-SPINDLE TAPPING HEAD

pletedly assembled, while the housing has been removed from the head in the view on the right. The housing and body of the head are made of aluminum, the lower plate of cast iron, and the plate providing the upper bearings for the spindles is of bronze.

Some of the holes to be tapped are grouped rather closely together. For this reason, the knurling on the Jacobs chucks which hold the taps is ground off, so that the operator's fingers are not liable to be pinched between the chucks. The clamp at the top of the head is secured to the spindle of the drilling machine and helps to drive the main spindle. The lug on the side of the body prevents the head from rotating, by pressing against the column of the drill press.

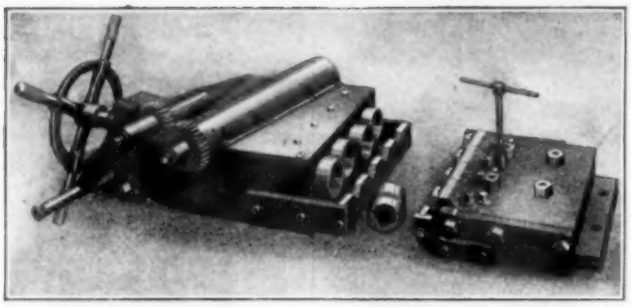
The gears driving the tapping spindles are compounded, the driving spindle carrying two gears of different sizes. In this way, the taps can be given the same speed of rotation, although they are placed at different distances from the center line of the driving spindle. It is possible, also, to vary the speeds of the different spindles by means of the gearing, so that taps of different pitch can be used at the same time, the rate of feed of each being kept the same.

The regular form of reversing mechanism made by the concern is provided for each tapping spindle. The direction of rotation reverses automatically when the head is raised or the work withdrawn. Heads can be furnished to fulfill the special requirements of individual jobs.

## Miller & Crowningshield No. 2½ Multiple-Spindle Fluting Centers

Miller & Crowningshield, Greenfield, Mass., have recently placed upon the market the No. 2½ multiple-spindle fluting centers shown in the illustration. The device is intended for use on the table of a milling machine when fluting taps or reamers, and it consists of an indexing head and a tailstock. It can be furnished with either three or four spindles, the same range of work being handled in each case.

The spindles can be turned simultaneously in the



MILLER & CROWNINGSHIELD NO. 2½ MULTIPLE-SPINDLE FLUTING CENTERS

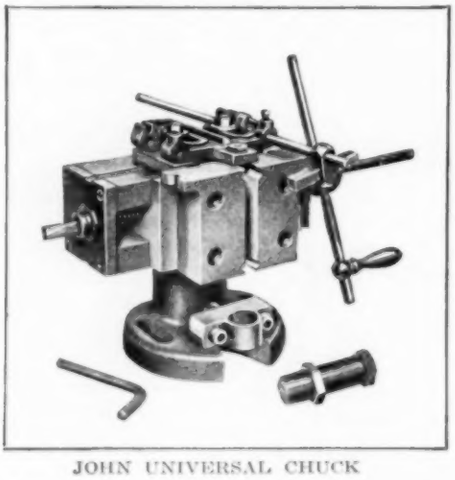
Specifications: No. of spindles, 3 or 4. Swing, 2¾ in. Capacity: to flute reamers from ⅛ to 2¾ in. in diameter; to flute reamers from ⅜ to 2½ in. in diameter. Width of head block: 3 spindles, 9½ in.; 4 spindles, 12½ in. Combined length of head and tailstocks: 3 spindles, 27 in.; 4 spindles, 28 in. Net weight: 3 spindles, 260 lb.; 4 spindles, 295 lb.

same direction by means of the crank, acting through hardened worms on the driving shaft. The indexing for pieces having any number of flutes up to 20 can be done by means of a single full turn of the indexing handle, change gears being provided so that the ratio can be varied to suit the number of flutes necessary. The spindles are clamped simultaneously by means of one handle. They are connected by equalizing levers, so as to allow of a variation in length of $\frac{3}{16}$ in. on the work being milled. They are provided with taper holes in the ends, so that the centers are removable. Centers to hold either round or square pieces can be furnished.

The tailstock is separate from the head, two styles being made. One style is solid and the other has separate vertical adjustment for each center. Either round or square stock can be held.

## John Universal Chuck

The John Chuck Co., Milwaukee, Wis., has added to its line a universal drilling machine chuck, shown in the illustration. The device is intended to be used for



JOHN UNIVERSAL CHUCK

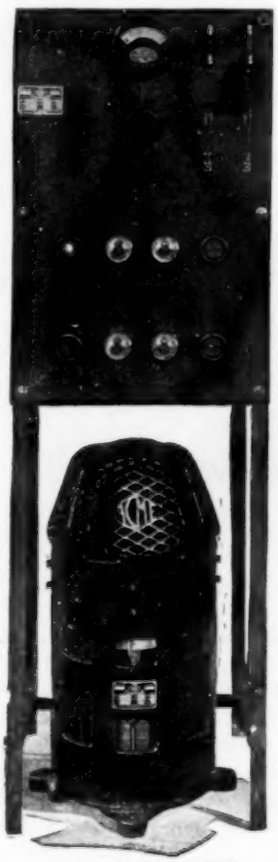
holding work while performing such operations as drilling, reaming, spot-facing, milling, centering, grinding and tapping, being employed chiefly on the tables of drilling machines. False jaws are made to conform to the work and if hardened will last indefinitely. An adjustable arm is furnished to hold the stop. A male or female center may be used in place of the stop. Guide bushings may also be used when necessary. The jaws are operated by means of a right- and left-hand screw, thus being self-centering. The screw is of high-grade steel and provision is made for taking up end thrust. A handle is provided, by which the screw can be operated from either end of the chuck.

The body and crossheads of the chuck are made of cast iron. Provision is made for taking up the wear on the crossheads. The screw and crosshead ways are housed in the body, protecting them from chips, grit and foreign substance. Extension bases can be furnished for long work.

The work can easily be placed in the chuck and quickly removed from the front when the operation is completed. The cutting tool is always in close proximity to the work but does not interfere with handling.

## Acme Automatic Charger for Electric Industrial Vehicles

The Acme Electric and Manufacturing Co., Cleveland, Ohio, has recently introduced a charger for the batteries of industrial trucks. The charger, known as the "Acme" and shown in the illustration, is intended to charge the battery at the rate recommended by the battery manufacturer. This feature is said to eliminate much of the trouble incident to the use of too high a charging rate, which will overheat and ruin a battery, or too low a rate, which will "starve" it.



ACME AUTOMATIC CHARGER FOR ELECTRIC INDUSTRIAL VEHICLES

The following points are brought out by the manufacturer: The chargers automatically take care of the charging rate without the use of rheostats; they give a tapering charge, which prolongs the life of lead batteries; they maintain a constant ampere-charging rate; and a safety control on the switchboard insures protection to the operator. All high-voltage parts are inclosed.

To operate the charger the ampere-hour meter is set to correspond to the truck meter and the charger is started by means of the automatic-switch handle. When the battery becomes fully charged the ampere-hour meter actuates a trip in the switch and the motor is shut down, the battery being disconnected simultaneously.

The charger takes up a little more than a square foot of floor space. Its motor is of liberal capacity and built for heavy service; and the generator is constructed to suit the battery. The shaft is one solid piece, rotating on ball bearings, the dynamically balanced armature and rotor both being mounted on it. The commutator has a large radiating surface and maintains a low operating temperature. Cool operation is afforded by

a Sirocco-type fan, which ventilates the machine by drawing air through the windings.

An automatically operating panel accompanies the charger. It is made of rubber-finished electrical slate mounted on an angle-iron frame and contains the following equipment: Volt-ammeter for indicating the battery charging rate and voltage, field rheostat for regulating the generator voltage, fuse for protecting the generator, ampere-hour meter for automatically controlling the charger, this meter also containing a dial which indicates the progress of the charge, and an automatic oil switch for controlling the motor and for disconnecting the battery on completion of charge.

## Diamond Type-C High-Duty Surface Grinding Machine

The Diamond Machine Co., 9 Codding St., Providence, R. I., has just placed on the market the Type-C, high-duty, surface-grinding machine. The machine is intended to do small work, although it can handle pieces up to 10 in. wide, 24 in. long and 8 in. high. It is made much heavier than the usual small surface-grinding machine, so that rigidity and freedom of vibration might be obtained. The maker claims that the type of construction and the distribution of the weight enable the machine to give both speed of production and accuracy and finish to the work.

The machine is intended for use where heavy cuts, as well as light finishing operations, must be made, provisions for wet grinding being incorporated. Guards are provided to prevent the cutting lubricant from splashing off the table. The coolant flows from the table through channels into a separate compartment within the base of the machine where the grit settles, allowing the clear liquid to be pumped back to the "spreader," or special form of nozzle which directs the stream to the point of grinding.

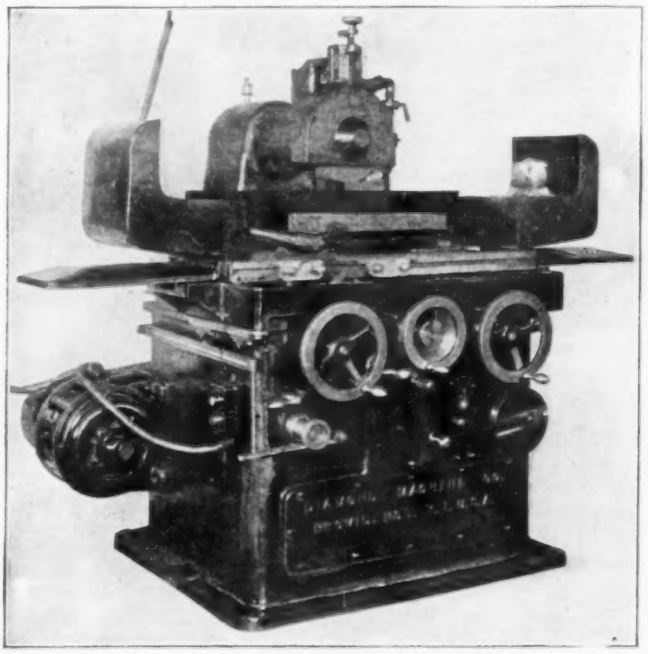
The machine has individual motor drive, the motor being a component part of the machine, and standard in all respects. Provision is made, however, to drive from a countershaft, in case that this be desired.

The wheel-head is cast integral with the vertical column. The combined column and head, rather than the head alone, can be adjusted vertically to suit the thickness of the work. The mass of the column added to that of the head is said to give stability to the wheel. Also, the construction makes possible a large area of surface for the ways of the vertical slide. The joint contains a long narrow tongue, which is said to hold the head firmly without excessive tightening of the gib.

The main spindle bearing is placed close to the grinding wheel. It is a composite ball and plain bearing, the plain bearing consisting of a floating bushing adjacent to the ball races. It is stated that chatter is thus practically eliminated, and that since the ball bearing takes care of almost the entire radial pressure there is no appreciable wear on the floating bushing. The rear end of the spindle is also ball bearing. The driving pulley is between the two spindle bearings and nearer the rear bearing, so that vibration of the driving belt is not apt to affect the wheel. The spindle is 2¼ in. in diameter between the bearings, so that flexure may be avoided.

The handwheels for the adjustments are arranged side by side at the top and front of the base, and are placed symmetrically with reference to the center line of the machine. The left-hand wheel controls the longitudinal travel and moves the table about 2 in. per revolution; the center wheel moves the table transversely 0.500 in. per revolution; and the right-hand wheel moves the wheel-head with the column vertically 0.100 in. per revolution. The outer edges of the rims of the two latter wheels have graduations for each thousandth of an inch, so widely spaced that the operator can split the thousandths into tenths. Ball thrust bearings are used on both the horizontal and vertical adjusting screws.

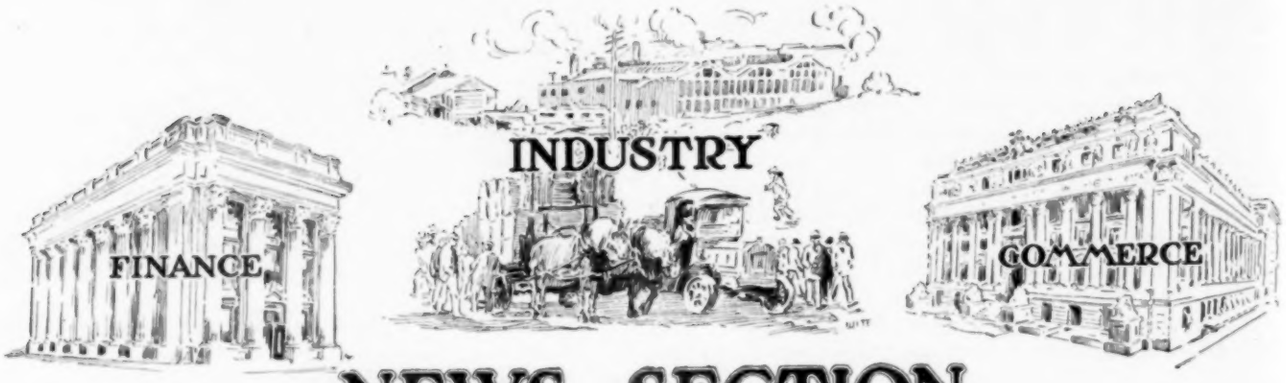
The ways providing for motion in the three directions of travel are completely covered by metal guards to prevent injury from abrasive dust or gritty water. Longitudinal travel of the table is accomplished by a train of belt-driven gears and reversal is effected by a single shifting belt. A device insures a complete shifting of the belt at each end of the stroke. A "stop trigger" is provided, a momentary pressure of the finger upon this trigger stopping the table at the completion of any stroke already begun. By means of a clutch connected with the left-hand wheel the table travel can be stopped at intermediate points.



DIAMOND TYPE-C, HIGH-DUTY SURFACE-GRINDING MACHINE

The traverse or "in and out" table feed is automatic, and adjustable from 0.001 in. to 0.020 in. per stroke. The feed takes place at both ends of the table travel and can be in either direction. There is an automatic stop which prevents overtravel and which can be set to disengage the feed at any desired point.

It is stated that the machine can take a cut 0.234 in. deep and ⅛ in. wide, or a total cross-section of 0.015 sq.in., one reason for the large size of the cut being that the usual sliding toothed clutch for reversing has been eliminated. Also, a pound of metal can be removed per minute, although it is not recommended that stock be removed that fast, because the grinding wheel would wear away too rapidly. However it is stated, since the capacity of the machine surpasses the capabilities of the wheel, the machine will not be strained in service and will have a long life.




# NEWS SECTION

## Situation of the Austrian Iron and Machine Industry

The rather acute iron shortage existing during the past months shows a considerable improvement of late. This improvement is due, in a measure, to the large shipments from Germany and Czecho-Slovakia, where a slump in business has freed considerable stocks for export. Apart from this, however, the inland production has made some headway lately. The cut in iron prices, of which we hear so much in the papers and which has taken place in other countries, has not made itself felt in Austria so far; on the contrary, cost prices are showing an upward tendency as is reflected by the recent increase of prices for Donawitz bar iron. Output of Styrian pig-iron during 1920 is estimated at 150,000 tons compared with 60,000 tons in 1919 and 600,000 tons in 1913. The output of crude ores shows an increase of 70 per cent only, owing to labor shortage. The Alpinische Montangesellschaft reports an increase in the output of finished rolled products of 20 per cent, against the preceding year.

Steel production shows an improvement which was chiefly brought about by the extensive use of scrap and old material, the reserves of which, however, are now stated to be rapidly diminishing. A distinct revival is noticeable in the special steel industry, particularly in the export business, which, of course, is due to a large extent to the lowered value of the krone. Supply of the special steel works with iron is more satisfactory now that the Alpinische Montangesellschaft and the Boehler works have blown in one more charcoal blast furnace each. The coal famine is still affecting the entire industry. The malleable iron foundries and openhearth furnaces are the chief sufferers. Foundries are commenting upon the reticent attitude of consumers owing to high prices which, they declare, had to be advanced by the recent wage concessions.

The aspects of the tool industry are more hopeful than they were a couple of months ago and the machine industry likewise reports, broadly speaking, satisfactory business, most of the works being well stocked with orders. The locomotive works turned out 211 engines and 73 tenders during 1920, which would represent about half their normal productive capacity. Old government orders having been completed, the federal department for traffic and transportation has recently placed another order for 76 engines and 700 cars.

Conditions in the railroad-car industry—which is busy on export orders—as well as the mining machinery, hoisting gear, pump and water power plant machinery, are decidedly better. Production of steam engines, however, is slowing down in the face of steadily decreasing demands, preference being given to motors of all kinds. Trade in the fittings industry is slumping.

Apart from the raw material question, it is the fuel supply problem that commands most of the attention in industrial circles. The total supply of inland and imported fuel amounted to 6,469,110 tons in 1920 compared with 4,824,123 tons in 1919. While the coal shortage is still being severely felt, a comparison of the supplies of January, 1919, and December, 1920, would show that an improvement is gradually taking place, 27.2 per cent of the total quantity required being supplied in the former and 41.9 per cent in the latter. Inland coal output has increased from 2,000,000 tons in 1919 to 2,500,000 tons in 1920 and the government is confident that the next few years will witness a doubling of the present output.

New magnesite and gypsum deposits have been discovered in the Styrian forests and it is hoped that it will be possible to start mining operations on a large scale at the end of the year. Several inland and foreign concerns, among others Krupp's at Essen, have already evinced a keen interest in the newly discovered magnesite deposits as the magnesite is stated to be excellently suited for industrial purposes.

## United Engineering Society Elects Officers

At the annual meeting of tne board of trustees of United Engineering Society held on Jan. 27, the following persons were elected officers of the society for the ensuing year: President, J. Vipond Davies; 1st vice-president, Calvert Townley; 2nd vice-president, W. L. Saunders; secretary, Alfred D. Flinn; treasurer, Joseph Struthers; assistant treasurer, George H. Pegram.

## S. A. E. Summer Meeting Dates and Place Set

The Society of Automotive Engineers has just announced the completion of arrangements for its 1921 Semi-Annual Meeting. The West Baden Springs Hotel at West Baden, Indiana, has been selected as the place for this year and May 24 to 28 are the dates set.

The program for the technical meetings has been outlined but it can only be stated that indications point toward the presentation of papers that will be classed among the most noteworthy presented at meetings in the past. There will be sessions devoted to fuel, research, aeronautics, farm power, highways and transport, and engineering relation to sales. The latter subject is particularly pertinent at this time and should arouse unusual interest.

The members and their guests can arrange to attend the annual 500-Mile Race at Indianapolis on Decoration Day as part of their vacation. West Baden is 120 miles south of Indianapolis and it will be noted that the S. A. E. meeting closes on Saturday and Decoration Day falls on the Monday following.

The officers of the Society and the Meetings Committee are extremely enthusiastic over the selection of West Baden and look forward to the greatest Summer Meeting ever held by the S. A. E.

## Georgian Business Men To Tour That State in Better-Business Campaign

About 150 prominent business men of Georgia, leaders in the state's industrial and commercial life, will make a tour of the state during the week of April 4 to 9 under the auspices of the Georgia School of Technology, of Atlanta, with the end in view of starting a business and industrial revival in Georgia that will result ultimately in the expansion and further development of the state's resources.

One of the principal objects of the tour, which will cover thirty-seven towns and cities, will be to bring about the development of Georgia's facilities as an iron-ore production center through the establishment of mines and furnaces in those sections where ore abounds.

# Business Conditions as the Big Banks of the Country See Them

## Peoples National Bank of Pittsburgh Thinks Stock Market Over-Discounted Situation—Steel Trade Outlook Something Like that of 1908

The favorable developments thus far in 1921 have been largely of a negative character. That is to say, none of the seriously disturbing things anticipated in December happened in January. The decline in the stock market during the closing weeks of 1920 apparently over-discounted the situation, and last month witnessed a substantial recovery in all kinds of securities, the demand for and advance in bonds, however, being more genuine than the movement in stocks.

It is possible that the financial preparations of corporations during the last quarter of 1920 to tide over an uncertain situation at the opening of the new year were also overdone, although affairs have not as yet progressed far enough to be positive on this point. At the opening of the second month of 1921, a somewhat more cheerful feeling prevails, particularly in those industries which were most depressed, and a partial resumption of operation has taken place.

### Steel Trade Outlook

The steel trade outlook is not much, if any, clearer today than it was a month ago. This is likewise true of the fuel industry. The principal things that have happened have been the establishment of a parity of quoted prices on steel products which enter most largely into tonnage, and the placing of some fair sized orders for steel rails. In a few instances smaller manufacturers are reported to have quoted concessions on the March, 1919, prices on certain products, but this was apparently for the purpose of testing market sentiment. The results were not satisfactory in the way of stimulating new business. There is no evidence of any concerted policy being agreed upon, but by common consent the trade, after the early announcement of readjustment of prices to the 1919 level, seems to have adopted the attitude of watchful waiting. Consumers also appear to have adopted a similar policy.

In this respect the situation somewhat resembles that which developed in the spring of 1908 following the severe financial disturbances of the last quarter of 1907. It will be recalled that during the first quarter of 1908 the mental state of the public was such that steel manufacturers reached the conclusion that considerations of price would not stimulate buying; that time would be required for a healing of the financial sores and commercial bruises of 1907 before confidence was recovered. The consequence was that the pig iron output fell from 25,781,000 tons in 1907 to 15,936,000 tons in 1908. There was a moderate shrinkage in Germany's output from 13,045,000 tons in 1907 to 11,813,000 tons in 1908, but in Great Britain, France and Russia the decrease was insignificant.

In other respects there was contraction in industrial activities in that year. Thus the number of miles of railroads built in the United States decreased from 5,212 in 1907 to 3,214 in 1908; the number of freight cars built from 284,188 in 1907 to only 76,555 in 1908, and the number of locomotives from 7,362 in 1907 to only 2,342 in 1908. There were 24 railroad receiverships representing 8,009 miles of track and $596,359,000 stocks and bonds in 1908 against only seven receiverships, 317 miles and $13,585,000 stocks and bonds in 1907. The index number of commodity prices fell from 9.0409 (Bradstreet's) in July 1907 to 7.7227 by the middle of 1908. It was not until June 1908 that a turn for the better occurred and bank clearings began to expand, and it was not until the beginning of the last quarter of that year that commodity prices began to recover.

### Analogies and Contrasts

In quoting these figures it is not intended to suggest an analogy between 1908 and 1921. That there is some analogy between the reckless speculation of 1906-7 and the industrial boom of that period and what happened in 1919-20, none will deny. That there was some similarity between the monetary stringency of the two periods is recognized. What is warrantably to be deduced, however, is that there is some likeness between price conditions and the attitude of consumers at the opening of 1908 and now. Whether the policy of 1908 of waiting for a change instead of trying to force a change will be adopted in 1921, is something that remains to be seen.

From the attitude of steel manufacturers last month the inference is permissible that the trade is inclined to await developments, on the theory that some months may elapse before there is a change of sentiment concerning prices. The fact is pointed out that in the textile trade some five or six months elapsed between the slash in wholesale prices and the beginning of buying by retail distributors, and that the "strike" on the part of consumers of clothing, shoes, etc., has not yet been entirely broken. In the automobile industry the recovery is still scarcely perceptible.

True, there is one basic difference between the steel trade and its affiliated industries and the others just mentioned, namely: there is at present no over-production and there is virtually no accumulation of surplus stocks. The reaction in steel and fuel was so sudden and overwhelming, and production costs were on such a high plane, that the brakes were applied with celerity, thus preventing congestion. However, as frequently pointed out in these reviews, the potential producing capacity of existing plants today is in excess of domestic needs, and for the future the industry faces competition not alone from Germany—the second largest potential producer and for the past five years excluded from outside markets—but it faces world competition. Furthermore, it faces a credit situation which, while arising out of causes differing from those which produced the 1908 situation, are fully as strained.

Whether well founded or not, the impression seems to be that steel prices will be lower before they are higher, and that the costs of construction—including the cost of capital as well as of material and labor—must be considerably reduced before there is a revival of activity.

## Guaranty Trust Co. of New York Says Price Drop Is More Gradual—Foreign Trade Largest on Record—Course of Foreign Exchange

Improvement in the business situation as a whole continues slowly, but more or less steadily. While the textile industries of New England are resuming operations, and farm products are moving more quickly, there are evidences of slackening activity in the steel and iron centers, and idle railroad rolling stock is increasing. Wholesale dealers and jobbers complain that while their prices have been reduced to costs, retailers continue to place orders on the day-to-day basis. The retailers declare that their prices are at rock bottom, and that offers of big reductions from the sale prices of a few months ago obtain no response from the ultimate consumer, who expects prices which would represent too big a loss to the stores, despite the apparent opportunity to replace at lower levels.

The consumer, on the other hand, has failed to be convinced by the fact that the price drop in this country is the most precipitate on record, and that he should not wait for a greater fall, if each element in the country is to do its share toward the maintenance of an orderly, conservative and safe readjustment. This attitude is due in part, of course, to the consumer's loss in buying power resulting from reduced wages,

part time work, and unemployment. The effect is seen in the decrease in railroad traffic, in the diminished bank clearings, in the falling off of mail orders, in the effort which producers are making to contract their cost expenditures. This last involves further wage reductions and a whole train of attendant circumstances which no one can predict.

### Constructive Factors

Holding the controlling lever and giving promise of approaching stability, however, are those factors in the situation which lie on the constructive side of the problem. Arrangements are being made to dispose of a large part of the country's copper surplus through private financing. The War Finance Corporation has made a survey of the markets and this country's ability to supply them. The Foreign Trade Financing Corporation is being organized to furnish credits to cover exportation of American products. There is a disposition on the part of industrial enterprises to avoid complete disintegration of their working forces or scrapping of their plants. In a dozen directions efforts are being made to extend business or at least to hold fast. Many look to see the traditional dullness of February give way to an Easter revival of old-time proportions. It is a period where constructive planning and optimism as to the future prevail over the mere surface conditions. Hence the perceptible feeling everywhere that the trend inclines toward improvement.

### The Price Movement

During the third week of January the decline in wholesale prices continued, but more slowly than during the first two weeks of the year. In the following week the rate of decline was accelerated, while during the first week of February the number of advances in the wholesale prices of household commodities as compared with the declines swung upward. Last week the declines were again in the majority. By the end of the month a comparison will probably show a net decline, but, as was the case for the month of January, at a slower pace than during the preceding month. In the opinion of business men who perceive the difficulties in the way of recovering from a severe setback, a normal condition would in the end have been reached more quickly had the sweep of price reductions inaugurated last year not been so intense and so wide.

### Foreign Trade in 1920

With exports valued at $8,288,759,000 and imports valued at $5,279,398,000, the foreign trade of the United States during 1920 exceeded all previous records. The figures show that exports were one-third greater than those in 1913 and our imports were nearly three times those of that year. As compared with 1919 our exports increased from $7,920,425,000 to $8,228,759,000, or by $308,334,000. Imports, on the other hand, increased from $3,904,364,000 to $5,279,398,000, or by $2,275,034,000. Our favorable balance of trade, as a result of these shifts in the course of trading, was reduced from $4,016,061,000 in 1919 to $2,949,361,000 in 1920.

During 1920 there were increases in United States exports to Germany, Spain, Canada, Central America, Mexico, Cuba, Argentina, Brazil, Chili, Uruguay, China, British India, Dutch East Indies, Japan, Australia, Philippine Islands, British South Africa, and Egypt. The most notable increase was, of course, in the case of Germany, which took merchandise to the value of $311,437,000 as compared with $92,761,000 in 1919. As for our imports they were increased from every country except Greece, Spain, Brazil, Uruguay, Australia, and British South Africa. Imports from Belgium increased from $7,700,000 to $47,443,000; from France, from $123,819,000 to $165,654,000; from Germany, from $10,608,000 to $88,836,000; from the United Kingdom, from $309,189,000 to $513,846,000; from Cuba, from $418,610,000 to $721,695,000; from Egypt, from $39,628,000 to $97,015,000.

### Foreign Exchange

The report of the Department of Commerce on the foreign trade of the United States during 1920, coming at a time when the European statesmen were gathered to discuss the amount of reparations money to be paid by Germany, has directed attention to the matter of foreign exchange, and the question of its course in the immediate future is being eagerly discussed. A sudden showing of strength by Sterling during the last week of January, which was accompanied by a rise in Continental exchange, was interpreted as reflecting the prospect of an early and definite settlement of the amount which Germany would be compelled to pay. Sterling exchange went to $3.89, the highest point touched since July of last year. The percentage of gain was even higher in the case of some Continental exchanges. There was also read into the rise the fact that general economic conditions are improving rapidly in the leading countries of Europe. In the case of Great Britain, while detailed figures are not available, it is probable that the current balance of trade is in her favor, not considering that much of her renewed foreign business is being done on long term credits. Demand bills on London sold from $3.79 to $3.85¼ last week. During the same week a year ago the rates ranged from $3.19 to $3.49¼. The low rate for the present year is $3.53¼.

The decision of the Entente Allied statesmen as to the sum Germany must pay, together with the provisions for a tax upon her exports for many years to come, was followed by a decline in European exchange.

## National City Bank of Chicago Sees Further Decline in Living Costs—World Hungry for American Capital

Continued liquidation in various branches of industry with a sufficient readjustment of commodity prices to depress quotations to an average level virtually 40 per cent below the high record of the inflation period, has benefited the general situation and brought about a more hopeful feeling concerning the future. The credit strain is less acute and within the past month there has been an encouraging movement by retail merchants throughout the country to lower prices to a level which should attract public buying on a large scale. This has led to the distribution of a large quantity of valuable merchandise and while the movement has been by no means completed, it has assisted in the thawing out of a portion of the frozen credits. This movement, together with the greater contraction of credits growing out of heavy selling by wholesale interests, is bringing the sort of relief that the country most needed in its campaign for lower prices. The government figures show that during December the retail cost of more than 20 food commodities declined 8 per cent while a recent analysis of average import prices showed that 71 articles were now obtainable at recessions. This is deflation of the right sort and shows how effective the nation-wide buyers' strike has been in relieving the markets of the more serious abuses which developed during the period when the seller and not the buyer was in absolute control of the market.

The country's spending power has been greatly reduced by the growing unemployment, the sharp decline in farm products, the reduction or omission of dividends by numerous corporations, and the various vicissitudes which are encountered in every community in a season of declining wages. Partial compensation for the wage reductions will come from the decline in living costs which are bound to become more pronounced as the season advances. It must be remembered also that statistics show that from 60 to 75 per cent of the original purchasers of Liberty Bonds still retain those securities. This represents a reserve purchasing power of great potential influence, since the war issues are largely in the hands of small investors who conceivably may be induced to make considerable purchases of merchandise when the price decline has gone as far as they think it should go. In this connection it is interesting to note that within recent months the public as well as the banks have been heavy purchasers of Treasury certificates of indebtedness. Out of $2,350,000,000 of such certificates outstanding only about $131,000,000, or less than 6 per cent, are held by the Federal Reserve banks as collateral for loans. This represents an important change and means that member banks which previously were heavy borrowers at

the Federal Reserve banks have found it more profitable to pass these investments on to their customers. It is easy to see that this movement would not have taken place at all had not rediscount rates been maintained at a level high enough to make it profitable for the banks to pay off heavy loans thus secured and pass on the underlying securities to the investing public where they belonged.

Money rates have reflected the temporary ease which usually follows the turn of the year when the return flow of dividend money to the great financial centers sets in. It is also true that the credit strain has been appreciably relaxed by the selling of merchandise and various collateral pledged for long standing loans. It takes much less credit to finance day to day business at the prevailing price level, and with production costs somewhat lower and household expenses reduced the pressure upon the money market must be relieved to some extent. There is nothing in these conditions, however, to indicate that a long period of easy money is in sight, or that the banks have abundant funds with which to finance a great volume of speculative undertakings. All the world is still applying for American capital, and it is evident that the new Belgium Government $30,000,000 loan will be followed by many others, these offerings being restricted only by the willingness of the American investing public to supply the funds required. The sharp rise in French exchange has been attributed to plans under way for a later loan for the French Government. It has been reported also that Great Britain later in the year may place a loan in the United States. Virtually all the South American countries would be glad enough to borrow here if the accommodation was forthcoming at acceptable terms. Inasmuch as such advances to the hardpressed European nations must be classed as highly essential financing and of a character contributing not alone to the restoration of crippled industries abroad, but also to the upbuilding of American industry which possesses the only productive machinery capable of providing the material required, it is easy to see that it is our duty to take care of these borrowers and make the advances required at terms consistent with the almost world-wide demand for such accommodation. The total demand for essential borrowings, therefore, is so great as to suggest the folly of expecting an accumulation of free credit soon.

## American Engineering Council Meets in Syracuse

The two-day conclave of engineers and technologists from all sections of the country began in Syracuse, N. Y., on Feb. 14 with the announcement by Herbert Hoover, president of the American Engineering Council of the Federated American Engineering Societies, of the appointment of a committee on Elimination of Waste in Industry.

The appointment of this committee, according to Mr. Hoover, marks the beginning of a great national assay of waste, in which from 100,000 to 200,000 engineers functioning through the council will attempt, by studying the nation as a single industrial organism, to locate the weaknesses in the country's production system.

A preliminary survey has already been organized and the different elements making for production waste, such as labor conflict, decrease in individual productivity, lack of co-ordination, and many other sources of industrial failure will be brought under the close scrutiny of the organized engineers of the nation with the aim of solving pressing economic problems.

The personnel of this committee follows:

J. Parke Channing, mining engineer of New York City, vice-president of the F. A. E. S., and member of the American Institute of Mining and Metallurgical Engineers, chairman.

Dr. Ira N. Hollis, president of the Worcester Polytechnic Institute, Worcester, Mass., and past president of the A. S. M. E.

L. W. Wallace of Baltimore, member of the A. S. M. E., member and president of the Society of Industrial Engineers, and treasurer of the F. A. E. S.

H. R. V. Scheel, assistant treasurer, Brighton Mills, Passaic, N. J., and member of the A. S. M. E.

L. P. Alford, editor of *Management Engineering*, New York, vice-president of the A. S. M. E., and director of the Society of Industrial Engineers.

George D. Babcock, manufacturing executive of Peoria, Ill., and author of "Taylor System in Franklin Management."

F. G. Coburn, Bethlehem Shipbuilding Co., former commander in the Construction Corps, U. S. Navy.

Morris L. Cooke, consulting engineer in management, Philadelphia, member of A. S. M. E., Taylor Society and Society of Industrial Engineers.

Harington Emerson, consulting engineer of New York, member of the A. S. M. E., and Society of Industrial Engineers.

E. E. Hunt, New York, formerly labor investigator for Clothing Manufacturers' Association, New York City, member of the Taylor Society.

C. E. Knoeppel, industrial engineer of New York City, member of the A. S. M. E., and the Society of Industrial Engineers.

Robert Linton, Montana mining engineer and member of the American Institute of Mining and Metallurgical Engineers.

Fred J. Miller, past president of the A. S. M. E.

J. H. Williams, engineer of New York City and member of the Taylor Society.

Robert B. Wolf, New York engineer, vice-president of the A. S. M. E., and a pioneer in the three-shift system of industry.

Mr. Hoover, who is president of the American Engineering Council, is also a member of the committee of which he is one of the principal sponsors. He will take a leading part in the assay of waste which the committee will conduct for the council. Mr. Hoover is a member of the American Society of Civil Engineers, president of the American Institute of Mining and Metallurgical Engineers and a member of the American Society of Mechanical Engineers.

The committee, it was announced, has already started work and a nation-wide plan will be put in operation from the New York and Washington headquarters of the council at once. The scope of the undertaking was outlined by Mr. Hoover in an address which he made following the dinner given by the council and which was attended by prominent engineers from every industrial center, including special delegations from the engineering centers of New York State.

### Other Problems

Morning and afternoon sessions of the council dealt with numerous social, industrial, political and technical problems. Betterment of Patent Office conditions in Washington through bringing about the passage of the Nolan Bill, was recommended.

The council gave formal approval to the action of the committee on Procedure requesting that President Harding put an engineer on the Interstate Commerce Commission. The Procedure Committee was authorized to name six qualified engineers.

Activity in behalf of a National Department of Public Works will be continued by the council through the Public Affairs Committee. It was recommended that engineering efforts be extended to the whole question of government reorganization planned under a special congressional committee.

The plan for the registration of engineers as presented in the council's report was endorsed and the appointment of another committee was authorized. The Russian Affairs Committee was made a new committee on International Relations, the personnel of the old committee being retained.

An invitation from Philadelphia engineers to hold the April meeting in that city was accepted. The June meeting will be held in St. Louis.

The council decided to recommend to President Harding that an engineer be appointed assistant secretary of war. No action was taken relative to the National Civic Federation, Fuel Conservation, or Merchant Marine Committee appointments. The Committee on Public Affairs was authorized to recommend the congressional appropriation to investigate deeper waterways—particularly those pertaining to the St. Lawrence project.

Mr. Hoover presided over the meeting of the executive board which represented universities, engineering societies and industries in many states. The vice-presidents of the council are Calvert Townley of New York, W. E. Rolfe of St. Louis, Dean D. S. Kimball of Cornell and J. Parke Channing of New York.

## Idle Freight Cars Increase

There were 323,376 idle freight cars on the railroad lines of the United States in the week ended Jan. 31, according to semi-official sources. This was a gain of more than 22,000 cars over the preceding week. Car loadings for the week ended with Jan. 29 were 699,936, a decline of 103,396 from the corresponding period a year ago and 18,361 less than in the corresponding week in 1919. The number of idle cars reported is the greatest in more than ten years.

## Lawrence Wilkerson Wallace, Secretary of American Engineering Council

Lawrence Wilkerson Wallace was elected secretary of the American Engineering Council at the meeting of the executive board in Syracuse, N. Y., on Feb. 14, succeeding L. P. Alford of New York who has been acting secretary since the formation of the council in Washington on Nov. 19, 1920. Mr. Wallace has been one of the most active figures in the council and from the time it was organized had been its treasurer. As vice-chairman of the council Mr. Wallace has been directing the work of the committee on Elimination of Waste in Industry, one of the principal committees of the council whose scope, following the Syracuse meeting, will be greatly broadened.

Mr. Wallace was born in Austin, Tex., Aug. 5, 1881. He was graduated from the Agricultural and Mechanical College of Texas in 1903 with the degree of B. S. in Mechanical Engineering. In 1912 he received the degree of M. E. from Purdue University. From 1903 to 1906 he served a special apprenticeship with the Santa Fe Railway Co. and was a member of the Purdue faculty during 1906-07 becoming head of the department of railway and industrial management. During this period Mr. Wallace conducted researches and did consulting work in railway mechanical engineering and factory management. For several years he investigated fire losses from locomotive sparks and gave expert testimony in many fire cases.

Mr. Wallace is well-known as an author of technical works. His volume on "Car Design" is used as a textbook as well as generally by designers. He also has written special instruction books for railway educational departments and papers on engineering and management topics before railway and management societies.

Mr. Wallace brings to the secretaryship of the council the experience of a manufacturing executive. He was formerly assistant general manager in charge of Production of the Diamond Chain and Manufacturing Co. of Indianapolis. More recently he has been director of the Red Cross Institute for the Blind in Baltimore, which provided vocational training to the blinded men of the military forces.

Mr. Wallace is a member of the American Society of Mechanical Engineers and the vice-chairman of the society's management section. He is now serving his third term as president of the Society of Industrial Engineers and is a past president of the Indiana Engineering Society. Mr. Wallace is a member of the International Railway Fuel Association, Western Railway Club, Master Car Builders' Association, Academy of Political and Social Science, and Western Efficiency Societies. Mr. Wallace is prominent in masonry, and is a past grand lecturer of the Grand Lodge of Indiana.

Mr. Wallace's social and commercial activities embrace a wide range. His work in New York as vice-chairman of the committee on Elimination of waste in Industry has been instrumental in bringing national attention to the purposes of the council.

Mr. Wallace, now at the temporary headquarters of the council in the Engineering Societies Building, New York City, will soon transfer his activities to Washington, where the council has established permanent national headquarters in the McLachlen Building. The Employment Service Bureau will be continued in New York where Walter V. Brown is in charge.

LAWRENCE WILKERSON WALLACE

## Automotive Engineers Hold One-Day Meeting at Columbus Tractor Show

The annual tractor session of the Society of Automotive Engineers was held at the New Southern Hotel, Columbus, Ohio, on Feb. 10. E. A. Johnston of the International Harvester Co. was in the chair at both morning and afternoon sessions and made an address on the trend of tractor design.

At the morning session D. L. Arnold, also of the Harvester Co., presented a report on an investigation of plowing speeds; John Mainland of the Advance Rumely Works reported for the committee on pulley widths and speeds; and O. B. Zimmerman read a paper on anti-freezing solutions for tractor cooling systems.

In the afternoon Professor O. W. Sjogren told of the Nebraska State University tests on sixty-nine different tractors and commented on some of the results obtained. A. W. Scarratt of the Minneapolis Steel and Machinery Co., in a paper describing a successful alcohol fuel equipment for tractor use, characterized alcohol as the coming motor fuel, particularly for foreign use, and called attention to the fact that even now alcohol is the cheapest fuel obtainable in some parts of the world. The discussion brought out a statement from Professor C. A. Norman of Ohio State University to prove that for a good many years to come gasoline would be cheaper than alcohol in this country because of recent developments in shale oil extraction processes and the wide extent of oil-bearing shale deposits.

The Tractor Banquet was held at the Hotel Deschler in the evening and was the occasion of three excellent addresses and a very clever moving picture. The "movie" was prepared by the Timken Roller Bearing Co. and was in the form of animated cartoons taking off the better known tractors and their designers. Colonel Fred Glover as toastmaster introduced Professor J. B. Davidson of Iowa State College, who spoke on the field in agricultural machinery development for the automotive engineer. He was followed by L. J. Taber, Master of the Ohio State Grange. Mr. Taber mentioned the rumored farmers' strike and gave it as his opinion that it was as unlikely as the conversion of the farmer to bolshevism. He told of conditions on the farm where all sorts of labor-saving agricultural machinery had been installed and the farmer's wife carried water a hundred feet to her kitchen door, and pointed out the opportunity for the household machinery manufacturer to educate and sell the farmer the inside equipment he ought to have to make life more livable for his family.

The last speaker was W. H. Stackhouse, President of the National Implement and Vehicle Association. Mr. Stackhouse discussed business conditions and prices of farm implements and called attention to the fact that the implement manufacturers had not been guilty of profiteering and that consequently there could be little reduction in their selling prices until material and labor costs were greatly reduced.

## The Machine Tools Trades Association and German Tools

FROM OUR EUROPEAN EDITION

The annual meeting of the Machine Tool Trades Association, held in the Hotel Victoria, London, S. W.—about sixty members being present—was chiefly remarkable for the discussion on trading in German machine tools. The chairman said that among machine tools were included small tools and wood-working machinery.

A fortnight ago we demonstrated in these columns that the proposal to exclude German tools, for that is what it amounted to, was quite impracticable, given complete unanimity in the association. The discussion showed pretty clearly that even the council, on whose account the resolution was put forward originally, was not unanimous. Sir Alfred Herbert however, perhaps rather quixotically, took personal responsibility for the resolution when moving it. And although the council is, we believe, composed both of manufacturers and merchants, he took this course partly at least because he is

both an importer and a manufacturer, so that, he said, if the resolution were carried he himself would suffer pecuniarily. The logic is a little doubtful perhaps.

While some members of the association who are merchants only might presumably stand to lose, those members who may be described as merchant-manufacturers could surely expect to pick up on the swings what they lost on the roundabouts. The suggestion that, being dealt with only by persons who were not members of the association, German tools would thereby further be discredited was possibly not put forward seriously: few people inquire on such a subject. The resolution was supported by arguments which combined personal sentiment and business.

The objection to trading in German goods most often in evidence, and it is undeniably cogent, lies in the present rates of exchange. The debate was, however, lifted to a higher plane by J. H. Barker, of Greenwood and Batley, and Mr. Massey, of the Openshaw firm. The former, in order that the whole position should be clearly understood, proposed as an amendment that American tools should also be excluded, and the gravity of the position was clearly shown by Mr. Massey, who recalled the duty the machine-tool trade and industry owe to the British engineering industry, that the latter shall have the best available tools with which to carry on work. After these two speeches little doubt remained as to the opinion of the meeting.

While certain speakers referred to the effect of such a resolution on opinion abroad, no one noted what was likely to happen in Germany. The fact is often overlooked that Germany was one of the best customers of Great Britain. Now the world will not return completely to peace conditions until trading between countries is general. The idea of an absolutely self-contained nation is in effect a proposal to return to a lower state of civilization. One can well imagine the delight with which such a resolution, if passed, would have been received by those who, for convenience, may be described as the industrial jingos of Germany. The probable result of such pinpricks is retaliation by way of the boycotting of British goods, as to which the worsted people of the Bradford district and, to come closer home, the high-speed steelmakers of Sheffield, would feel the effects pretty directly.

Contributions to the discussion on one side or other—mostly on one side—were made by C. Wicksteed, F. Pollard, E. Parkinson, H. Selson, J. E. Cohen, W. Hatch, R. Stirk, and others, and the suggestion of W. Deakin that the matter should be deferred a year being rejected by the chairman and the meeting generally, the resolution was defeated by 35 to 11. Any danger of a split in the association was therefore avoided.

The members are free to deal in German goods, not furtively as the chairman had suggested, but openly and frankly, and the question is immediately raised as to the value of the recommendation that members should not advertise in journals publishing advertisements of German goods. For if a merchant is entitled to buy and sell German goods, he is, we presume, equally entitled to advertise the fact. The discussion showed that machine-tool people see that the war is ended, and that British people at least still hold that Hymns of Hate are merely matters for laughter. The association may be congratulated on taking a broad national view in circumstances which might well have excused a narrow outlook. It was decided by 38 or 39 (there being two different countings) to 15 to hold the next exhibition in 1924.

## Business Conditions To Improve From Now On

Business conditions will improve from now on, says Archer Wall Douglas, chairman of the Committee of Statistics and Standards of the Chamber of Commerce of the United States, in his monthly review of business issued on Feb. 21.

"The most convincing evidence that we are on the high road to recovery," Mr. Douglas says, "is found in the universal report brought by traveling salesmen from every section of the country, of steadily growing sentiment that 'business will be better in the spring'—not a sudden return to prosperity, which is neither likely nor desirable, but a slow and natural working out of those processes of liquidation which are now in full operation.

There are few who are more responsible than these same traveling salesmen for the growth of this healthy sentiment, which in effect is the recognition of the inherent soundness of the situation, and that the remedies for it lie largely in constructive action. Not only is sentiment improved, but there is definite increase in the volume of business done. It is not a very great increase, but as Mercutio says, ' 'Twill do,' for it forecasts the beginning of better days. Farmers are gradually bringing their produce to market. Bankers are slowly 'loosening up' and extending to farmers and dealers money and credit, the two vital factors needed to restore the situation. In the tobacco districts of Kentucky, where the deadlock between sellers and buyers seemed unbreakable, there are increasing reports of agreements made and sales consummated.

"Despite the general story of farmers withholding their products, there is daily a steady stream of grain and livestock coming to market, not in full volume, but enough to assist in alleviating the situation. Shipments of early fruits and vegetables from California and the South are running heavily, some 10,000 cars per week, thus distributing much-needed cash among the growers. Caution and conservatism are still universal among merchants in buying, and most orders are restricted to immediate wants for keeping up assortments.

"Out in the world of cold, hard facts, few take much stock in the current prophesies of the coming of a new prosperity at any specified date. Nor yet in those mystic charts which foretell when declines will cease, and business resume its upward march. For it is perfectly obvious that prices have not reached bottom in all lines, and even a Wall Street lamb does not buy heavily on a falling market. The general thought inclines to early spring, March or April, as the date when distinctly definite improvement will set in, though in many parts of the Cotton Belt the belief is that June is early enough to expect a decided change. Yet scarcely any believe that present conditions will prevail throughout the year.

"All are agreed that the only way to hasten matters is by the general exercise of the homely virtues of hard work and economy.

"The South intends to illustrate this theory in a very practical fashion this year by raising the cheapest cotton crop in years; a crop grown on a "corn meal and syrup" diet system of expense. Also farm labor everywhere will be cheaper this year and improved farm machinery is decreasing the cost of production and increasing efficiency per man.

"The present distressful situation brings into vivid relief the inherent and fatal weakness of one-crop countries—cotton and tobacco as salient examples—and how they fail their growers in time of tribulation. The saving grace of the situation today consists in the revenue producing capacity of the numerous factors in the diversified farming sections where livestock (especially hogs and poultry) and dairy products are furnishing ready cash to the farmer and helping him liquidate his obligations. Fortunately the South has progressed a long way toward diversification since the last era of low-priced cotton.

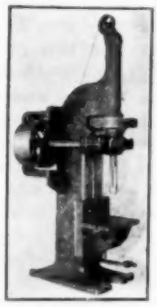
"The tremendous importance of the dairy industry may be gathered from the story of its annual productions. Ten billion gallons of milk, 1,500,000,000 pounds of butter, and 800,000,000 pounds of cheese. To these must be added its hundreds of millions of dollars invested in dairy cows, buildings, land and general supplies. Production is now, and will continue to be, the dominant factor in the business situation. Yet it must be accompanied by intelligent forethought as to adequate distribution of the thing produced. Last summer a large proportion of the garden truck crop in a section of the Rio Grande valley was a dead loss to growers because of lack of cars. Somewhere there has been lack of co-ordination between production and transportation.

"A recent expression of opinion by a number of representative business men throughout the country brought out the significant fact that they were not so much concerned about the problems of labor, material, prices, transportation, and collection on the whole, as they

# Condensed-Clipping Index of Equipment

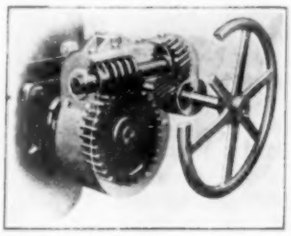
*Patented Aug. 20, 1918*

**Press, Power, "Flexible"**
General Manufacturing Co., Detroit, Mich.
"American Machinist," Jan. 20, 1921



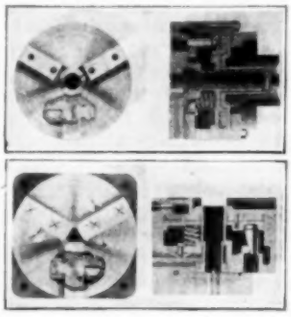
The machine is called "flexible" because the amount of pressure applied by the ram can be varied by the operator from a few pounds to 20 tons, depending upon the pressure applied to the pedal. It is stated that a wide range of work can thus be handled, the machine being adaptable to such work as push broaching, straightening, and pressing in bushings. The ram has a stroke of 18 in. with a speed when not resisted of 100 to 140 in. per minute, and the position of the knee is adjustable, a maximum distance of 28 in. between the table and the ram being obtainable. The knee is adjusted for height by means of a rack and pinion, and it is held in position by clamping gibs tightened by six nuts, and by a spring plunger engaging teeth cast in the front of the column. Power is applied to the ram through a worm and worm gear of 10 to 1 ratio.

**Ladle, Crane, Geared, "Helical-Worm"**
Whiting Foundry Equipment Co., Harvey, Ill.
"American Machinist," Jan. 20, 1921



The device consists of a pair of forged-steel helical gears actuated from the handwheel, and a worm engaging a gear mounted and keyed on the trunnion of the ladle. The use of the worm-gear makes the device self-locking. The worm shaft is placed at an angle, so that the forged-steel worm meshes properly with the straight teeth of the large cast-steel gear. All gears have machine-cut teeth. They are inclosed in a dustproof cover, are readily accessible and can be oiled through small oil holes with spring caps. The gearing is mounted on the trunnion instead of on the ball, so that distortion of the ladle, or ball, or wearing of the trunnion journals, will not interfere with the alignment of the gears.

**Chucks, Drill-Press, and Pilot-Bar, Air-Operated.**
Frontier Chuck and Tool Co., 30 Letchworth St., Buffalo, N. Y.
"American Machinist," Jan. 20, 1921

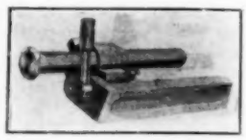


The chucks are made with either two or three jaws, in either the manufacturing or the adjustable type, and in four sizes, 10, 12, 15 and 18 in. The chuck shown at the top is intended for use when the tools employed are equipped with pilot bars. The pilot bushing is screwed into the chuck and does not slide on its seat. A chuck intended for holding work on the table of a drilling machine is shown below. The bushing extending through the center of it allows chips to fall through. The base rests on four legs, thus raising the bottom of the air cylinder about 1 in. above the table.

**Shifter Belt, "Spurgin"**
R. G. Haskins Co., 27 S. Desplaines St., Chicago, Ill.
"American Machinist," Jan. 20, 1921

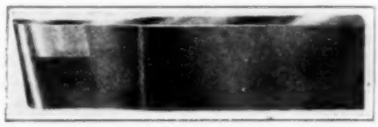
This device consists chiefly of two strikers or guides, one at the top and the other at the bottom of the belt and operated by a single lever, so as to enable the shifting of the belt on the cone pulleys. The belt guides are fitted with rollers running on oilless bearings, both on the edges and on the faces of the belt, so that it is not damaged by the guides. They are automatically locked in position, so that the belt stays on the steps to which it is shifted.

**Threading Tool, Internal, "Rapid"**
Cruban Machine and Steel Corporation, 63 Duane St., New York
"American Machinist," Jan. 20, 1921



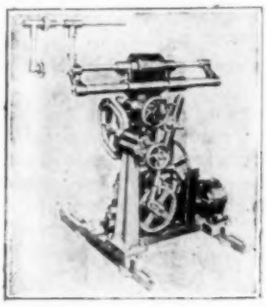
The cutting tool is mounted on a bar carried in a bracket hinged on the shank of the holder. The tool can thus be moved through a small arc by means of the lever. When the cut is started, the lever is turned down. When the end of the cut is reached, the lever is raced, thus dropping the cutter back out of contact with the work. The feed is then reversed so as to bring the cutter to the starting position, the cross-slide being fed in to the proper depth for the next cut. By means of a screw, the amount of swing of the tool can be limited, so that the back of the tool does not strike the threads. Three sizes are made, the shanks being $\frac{3}{4}$ x $\frac{3}{4}$, $\frac{1}{2}$ x $1\frac{1}{4}$ and $\frac{3}{4}$ x $1\frac{3}{4}$ in. in size. The smallest diameter of the hole that can be threaded is $\frac{5}{16}$ in.

**Cement, Steel, "Cinch"**
Deeds & Chapin, 2138 Montcalm St., Indianapolis, Ind.
"American Machinist," Jan. 20, 1921



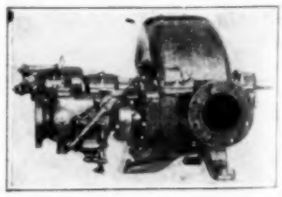
The cement is in the form of a powder and is intended for fastening high-speed steel or stellite to low-carbon steel in making cutting tools, punches, dies and shear blades. When tipping the cutting edge of a lathe tool, such as shown in the illustration, it is stated that only 3 per cent of the tool need be made of high-speed steel. The cement melts at approximately the hardening temperature of high-speed steel, or 2,200 deg. F. Thus the cementing and the hardening of the tool can be done at one heating. It is stated that the cement fastens the steel parts securely and solidly supports the cutting edge and that one pound of it is sufficient to cement in place 250 pieces each 1-in. square.

**Buffing Machine, Contour**
Contour Buffing Machine Co., Inc., 416 Bird Ave., Buffalo, N. Y.
"American Machinist," Jan. 20, 1921



This machine is intended for feeding against the wheels of standard buffing or polishing lathes, articles of circular, oval, triangular or rectangular form. It is driven by an electric motor attached to the bed plate, which rests on rails that permit a travel of 8 in. to or from the polishing wheel or buff. The work-carrying spindle is slowly rotated and is supported on a sliding frame that has a mechanical reciprocating motion adjustable up to 16 in. in length. The column is supported on trunnions at the bed plate and is free to oscillate through about 10 deg. When polishing the periphery of an article of irregular contour, the oscillating movement is controlled by a cam suited to the shape of the piece. Weight crated, 1,000 lb.

**Turbine, Steam, Curtis Type**
General Electric Co., Schenectady, N. Y.
"American Machinist," Jan. 20, 1921



This turbine is suitable for driving such apparatus as centrifugal pumps and blowers. It is made in either one, two, or three stages, and operates at steam pressures of from 50 to 300 lb., either with or without superheat, and either condensing or non-condensing. The illustration shows a two-stage, type-*L* unit. The turbine is heavily and rigidly constructed. The casing is divided horizontally into halves, the upper of which can be easily raised. The steam connections are so arranged that they need not be disturbed when it is desired to remove the top of the casing. The steam passes through the first-stage nozzle from the steam chest, the nozzles being opened or closed by hand valves placed in the steam chest. The governors control the flow of steam.

*Clip, paste on 3 x 5-in. cards and file as desired*

were with the question of sales. In other words, when demand starts up, the whole tangled economic skein will begin to unwind like the nursery rhyme, when the butcher began to kill the ox, and the ox began to drink the water, then the pig, at the other end of the rhyme, began to get over the fence, and the woman got home that night.

"While unemployment is still larger, there is more work and less idleness on the whole in industrial sections. The lessened production in manufacturing has naturally resulted in decreased output of coal. Also in the oil fields there are falling prices.

"While building is practically at a standstill throughout the country, save in Los Angeles and around Palm Beach and Miami, there exists the general expectation in nearly all sections, of a revival in the early spring, somewhere around the first of April, provided certain contingencies obtain; namely, lower costs of labor and the assurance of steady, efficient work, lower costs of building material, and greater ease and certainty of obtaining loans from banks on construction work. The nature and extent of building during this year will depend almost entirely upon the extent to which these factors prevail.

"There will probably be more building in the cities than in the towns and less in the country than in either of the former two."

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### A. England Succeeds S. W. Dudley as Chief Engineer of Westinghouse Air Brake Co.

The Westinghouse Air Brake Co. has announced the appointment of Alexander England as chief engineer to succeed S. W. Dudley who resigned on Feb. 1 to join the faculty of Yale University as a professor of mechanical engineering.

Mr. England has been a member of the Air Brake organization for the past 22 years and had occupied the position of assistant chief engineer since shortly after the appointment of Mr. Dudley as chief engineer in 1914. He is regarded as a man of sound judgment and discernment in the treatment of engineering problems and is the author of a number of important mechanical improvements in connection with the company's products, especially as concerns the development of the Westinghouse steam and motor-driven air compressors for railroad and traction service.

Other changes occurring as a result of Mr. Dudley's resignation and the promotion of Mr. England have been announced as follows: R. E. Miller, engineer of Tests and Inspection, promoted to superintendent of Tests and Inspection; W. E. Dean, assistant engineer of Tests, promoted to engineer of Tests; and A. A. Mackert, chief inspector, promoted to engineer of Inspection. Mr. England will report to C. C. Farmer, director of engineering of the Westinghouse Air Brake Co., and will maintain his headquarters at the Wilmerding plant.

## Business Items

The Scovill Manufacturing Company, of Waterbury, Conn., manufacturers of brass goods, etc., has petitioned the Connecticut State Legislature for authority to increase its capital stock from $5,000,000 to $25,000,000.

The Jewell Belting Company, of Hartford, Conn., manufacturer of factory leather belting, etc., plans to increase its capital stock from $1,000,000 to $2,000,000.

At a meeting of the Chas. Miller & Son Co., Utica, N. Y., Charles Miller was elected president; D. S. Howard, first vice president; R. U. Sherman, second vice-president; A. H. Dobson, treasurer.

N. B. Payne & Co., 25 Church St., New York, dealer in electric cranes and hoists, has extended its lines of material handling machinery to include the portable conveyors of A. C. Warner Co., Philadelphia and Chicago; automatic coal elevators, and McKinney-Harrington package pilers and car loaders.

The Oxford Brass Foundry, Inc., Philadelphia, has been incorporated under Pennsylvania laws to manufacture brass, bronze and other metal castings.

The Hansel-Mulranen Co., Inc., was organized at Syracuse, N. Y., to make metal products of various kinds. The company is capitalized for $10,000, of which amount half has been paid in.

## Personals

WALTER B. LASHAR, president of the American Chain Co., of Bridgeport, Conn., was elected a vice-president of the First National Bank of Bridgeport, at the annual meeting held recently.

CHARLES L. ALLEN, president and general manager of the Norton Co., of Worcester, Mass., manufacturer of grinding machinery, etc., has recently been elected a vice-president of the Eastern States Agricultural and Industrial League.

HARRY W. OSGOOD has recently been appointed plant engineer at the Fore River yards plant at Quincy, Mass., of the Bethlehem Shipbuilding Corp., Ltd. Mr. Osgood has been with the Bethlehem Co. at Bethlehem, Pa., for the past two years.

EDMUND OTTO, for several years secretary of the Hardware and Supply Co., and prior to that associated with Manning, Maxwell & Moore, Inc., New York, is now associated with N. B. Payne & Co.

DONALD S. MICHELSON, who became general manager of the Globe Machine and Stamping Co., Cleveland, Ohio, in September, 1920, was elected president of that company.

P. D. WAGONER, of New York City, has been elected president and general manager of the Elliott-Fisher Co., Harrisburg, Pa., manufacturers of bookkeeping machines. C. S. Duncan was appointed secretary-treasurer of the same company, and E. R. Baines, general auditor.

## Obituary

After an illness of about six months, caused by heart trouble, W. THOMAS STARR, president of the B. F. Starr Co., manufacturer of mill machinery, etc., died on Feb. 1 at his home in Baltimore. He was sixty-three years old.

WILLIAM PENN SNYDER, head of the Shenango Furnace Co., died recently at his home in Pittsburgh. Mr. Snyder was also president of W. P. Snyder & Co., Shenango Steamship and Transportation Co. and an ore company, besides being connected with other companies.

GEORGE R. RANDOLPH, age 26, Pittsburgh sales representative of the Warner & Swasey Co., Cleveland, Ohio, working under the jurisdiction of the Buffalo office, died on Feb. 3.

## Forthcoming Meetings

The Taylor Society will hold its winter meeting in Springfield, Mass., on Feb. 24 to 26.

The National Machine Tool Builders' Association has advanced the date for its semi-annual meeting. This meeting will be held at the Hotel Cleveland, Cleveland, Ohio, on Feb. 24, 25 and 26, instead of Atlantic City in May. The general manager is Ernest F. DuBrul, 817-818 Provident Bank Bldg., Cincinnati, Ohio.

The National Metal Trades Association will hold its annual convention at the Hotel Astor, New York, on April 18, 19, 20, 21. Homer D. Sayre, Peoples Gas Building, Chicago, Ill., is secretary.

The Engineering Section of the National Safety Council will hold its annual meeting in Philadelphia on Feb. 28. This meeting will be held jointly with the Philadelphia section of the A. S. M. E.

The annual meeting of the American Welding Society will be held in the Engineering Societies Building, 29 West 39th St., New York, on April 22.

The Society of Industrial Engineers will hold its national convention in Milwaukee, Wis., on April 27, 28 and 29. Geo. C. Dent, 327 So. La Salle St., is business manager.

The National Foreign Trade Council will hold its eighth annual convention in Cleveland, Ohio, on May 4, 5, 6 and 7. J. G. Hammond, care of the Council, 409 Park Bldg., Cleveland, is secretary.

A triple convention of the National Supply and Machinery Dealers' Association, the Southern Supply and Machinery Dealers' Association and the American Supply and Machinery Manufacturers' Association will be held in Atlantic City, N. J., May 16, 17 and 18, 1921, with headquarters for all three associations at the Marlborough-Blenheim. F. D. Mitchell, 4106 Woolworth Building, New York, is secretary of the last-named association.

The American Society of Mechanical Engineers, 29 W. 39th St., New York, will hold its spring meeting in Chicago, May 23 to 26 inclusive, at the Congress Hotel.

The Society of Automotive Engineers, 29 West 39th St., New York announces that its summer meeting will be held at West Baden, Ind., on May 24 to 28 inclusive.

# Condensed-Clipping Index of Equipment

*Patented Aug. 20, 1918*

**Hammer, Forging, Power**

Brett's Patent Lifter Co., Ltd., Coventry, England

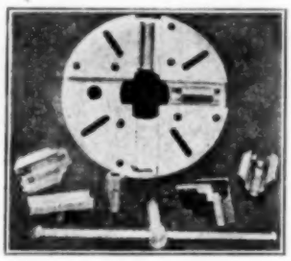
"American Machinist" (European Edition), Sept. 18, 1920

This machine is suitable for general forging and for tool work, taking round or square stock up to 3 in. thick. The weight of the ram exclusive of the top die is 200 lb. The stroke is usually 7 in., but it can be extended to 10 in. by the fling of the hammer when working at the top speed of 250 strokes per minute. The drive is by a slipping belt which is put into operation by means of a tightening pulley operated by a pedal. Springs are provided in the driving mechanism to prevent undue shock from the blows. The anvil block is a separate casting from the frame. The weight of the machine is 4,370 lb.

**Chucks, Four-Jaw, Lathe**

Vickers, Ltd., Broadway, London, S. W. 1.

"American Machinist" (European Edition), Sept. 18, 1920

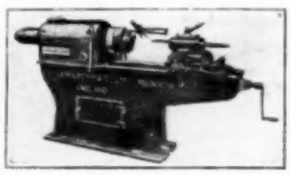


This chuck is available in nine sizes, the range being from 8 to 24 in. outside diameter. The parts are shown in the illustration. The body is a steel casting, while the screw and nut are also of case-hardened steel. The jaws are steel stampings, case-hardened and ground to suit the form of the slot. They are reversible and will also interchange with a group of bodies comprising three different sizes. The screw always has a full bearing in the nut and, the parts being interchangeable, the nut and screw can easily be replaced when worn.

**Tapping Machine, Nut**

J. Holroyd & Co., Ltd., Milnrow, England

"American Machinist" (European Edition), Sept. 18, 1920



This machine threads nuts up to 4-in. in diameter by ¾ in. pitch by 6 in. long. The work spindle is 4½ in. in diameter and is driven by belt. At its front end the spindle carries the chuck or jig plate to secure the work. Interchangeable lead-screws of various pitches are supplied, the screw used running in a gunmetal nut fastened in the head and split to adjust for backlash. The traverse of the spindle is 9 in., the three forward speeds being 15, 30 and 45 r.p.m., with a constant quick return at 50 r.p.m. The saddle carries a turret toolpost, so that roughing and finishing tools may be employed. The height of centers is 9 in., the center being 3 ft. 3 in. from the floor level. The floor space is 2 ft. 6 in. by 8 ft. The weight is about 35 cwt.

**Fluting and Backing-Off Machine, Twist-Drill**

J. Holroyd & Co., Ltd., Milnrow, England

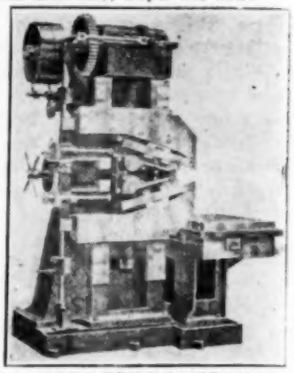
"American Machinist" (European Edition), Sept. 18, 1920

This semi-automatic machine is intended for fluting and also backing-off two-lip twist drills. Fluting and backing-off take place simultaneously, the machine having two spindles for each purpose, that is, four milling cutters set at the required angles. Drills with constant or increased twist and with parallel or taper core can be produced, and the relief can be varied. A ⅝-in. high-speed-steel drill, 3 in. long on the flutes can be grooved and backed off in 2 min. The machine shown, the No. 3 size, will flute lengths of 4½ in. The machine is made in a number of sizes to suit drills up to 1½ in. All movements are graduated, and the machine can easily be set for change from one size to another.

**Slotting Machine, Sprue**

Clifton & Baird, Ltd., Johnstone, England

"American Machinist" (European Edition), Sept. 18, 1920

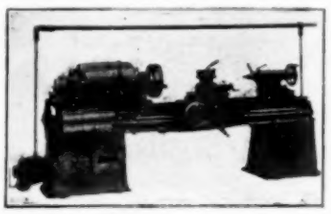


This machine has a stroke variable up to 18 in. With a maximum depth of cut of 8 in., turning over the work will allow risers 18 x 16 in. to be removed from steel castings. The machine is really a double slotter with two tools, one operating on each stroke. One tool has a V-nose, and the other is square so as to remove the corners of the cut. The tools are reciprocated by a vertical screw of quick lead, driven by a belt through bevel gears and reversing clutches placed in an oil-tight box at the top of the column. The machine also has a facing at the back so that it can be driven by a reversing electric motor, used in place of the mechanically operated reverse.

**Lathe, Toolroom**

Smith, Barker & Willson, Ltd., Halifax, England.

"American Machinist" (European Edition), Sept. 18, 1920

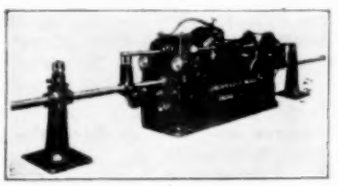


The lathe swings work 17½ in. over the bed and 10¼ in. over the saddle, admitting 38½ in. between centers. The drive is through a hardened-steel worm and a phosphor-bronze wheel, and then through a friction clutch to a gear box placed in the leg under the headstock. In the head itself are three friction speeds, one direct and the others through double back gearing. With the four speeds obtained in the swinging gear box, twelve spindle speeds are available. Screws can be cut without reversing the lathe, only the lead screw being reversed. (The spindle is bored 2⅛ in. and has a front bearing 3½ x 5½ in., the back bearing being 3 x 3⅝ in.) Weight, about 3,400 lb.

**Grinding Machine, Bar, 2½-In.**

J. Holroyd & Co., Ltd., Milnrow, England

"American Machinist" (European Edition), Sept. 18, 1920



This machine is intended for grinding bars 1 to 2½ in. in diameter and 7 to 18 ft. long. The bars are gripped by rotating disks and run through steadyrests. They do not have to be centered. It is said that 2-in. bars, say, 0.003 in. above size and, within limits, eccentric in form, can be ground to within plus or minus 0.0002 in. as to size and roundness. The bars are required to pass through the machine twice, the surface speeds being, say, 60 ft. per minute and the feed forward 1 in. per revolution. The surface speeds available range from 30 to 80 ft. Two wheels, each 20 in. in diameter by 1½ in. wide, are employed side by side. The peripheral speed of the wheel is about 6,500 ft. per minute. Weight, about 4½ tons.

**Distance-Pieces, Combination**

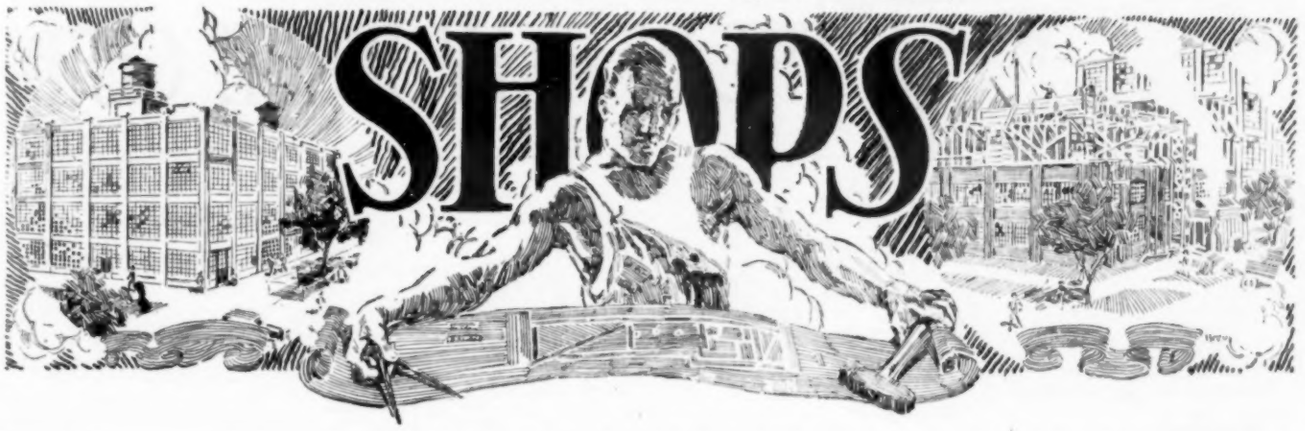
Burton Griffiths & Co., Ltd., Ludgate Square, London, E. C., England.

"American Machinist" (European Edition), Sept. 18, 1920

These pieces are intended for such purposes as the accurate spacing of milling cutters on an arbor. They are manufactured in ring form, a set containing 56 pieces. An instruction chart is included for determining the combination required. The distance pieces vary in thickness from 0.05 to 1.0015 in., arranged to give graduations from 0.15 to 2.1 in. With a maximum of three pieces in combination, any of 3,900 dimensions between these limits can be obtained. The pieces themselves are accurate between plus and minus 0.0001 in. Blocks are also available in solid cube form to be used as parallels or packing blocks, and are manufactured to the same limits.

*Clip, paste on 3 x 5-in. cards and file as desired*

# NEW *and* ENLARGED




## Machine Tools Wanted

**If in need of machine tools send us a list for publication in this column**

**Fla., New Port Richey**—The Palm Products Co., furniture manufacturers, D. L. Rush, Purch Agt.—
One 36 in. band saw.
One Universal woodworker, saw table with boring attachment, dado head, etc.
One drum and disk sander.
Sand-blast equipment for roughing polished surfaces.
One split weaving loom.

**La., New Orleans**—Estate R. G. Holzer, 317-29 Burgundy St., architectural and sheet metal work, contractors and jobbers, etc., J. E. V. Holzer, Purch. Agt.—
One small bench lathe with screw cutting adjustment, 8 or 10 in. swing.
One power shaper for cutting 14 and 20 in. material.
One power planer to plane material 12 x 12 in. wide up to 10 ft. long or 24 x 24 in. wide up to 11 ft. long.
One power hack saw to cut material 8 x 8 and smaller.
One small power bench drill.
One power angle cutter to cut angles 3 x 3 and smaller, thickness ⅜ in.
One power squaring shear to cut material ¼ or ⅜ and lighter to cut 10 ft. soft sheet steel.
One ring and circle shear to cut ⅜ soft sheet steel.
One 10 ft. power press or brake for bending material ⅜ or ½ and lighter.
One power gang slitting shear with extension table and gang to cut material 36 in. wide and narrow gauge ranging from 20 gauge and lighter. Also extra pair of cutting rollers.
One power or hand squaring 36 in. wide, state gauge of material machine will cut.
One power wood swing saw used for cutting off wood strips with and without motor attached to ceiling.
State condition, age, style, number, make, and shipping weight, (used).

**Ky., Louisville**—The Mercury-Body Corp., 503 Marion E. Taylor Bldg., C. E. McCormick, Mgr.—Bids until March 1 on machine tools.

**Tenn., Johnson City**—The Automobile Renewal Co., Inc., B. A. Mathes, Pres. and Mgr.—
One 14-24 in. gap bed lathe.
One 20 in. B. A. drill.
One cylinder grinder.
One 10 in. sensitive drill.
One Universal burning-in and testing machine.
Battery charger and tools.
Welding outfit.
One small heat treating furnace.
Small tools, etc.

**Va., Richmond**—The Armstrong Motor Co., 1813 West Broad St., (auto rapir work)
One lathe.
One drill press.
Auto repair machinery.

**Va., Richmond**—F. E. Carson, 719-21 North 21st., F. E. Carson, Purch. Agt.—mechanical outfit for new auto repair shop.

**Va., Richmond**—W. C. Jackson, 1643 West Broad St.,—lathe, drill press, universal boring bar and vulcanizer for auto repair shop.

**Va., Richmond**—McMullen & Benton, 1649 West Broad St.—6 in. vise and small lathe for their auto repair shop.

**Va., Richmond**—C. P. Parish, 1647 West Broad St.—power drill press, bench drill press, grinding wheels, gear press and small lathe for auto repair shop.

**Va., Richmond**—A. Plageman, 1639 West Broad St.—mechanical out-fit for auto repair shop.

**Va., Richmond**—Sherbridge & Hare, 100 North Meadow St., (auto repair shop)—small lathe and drill press.

**Va., Richmond**—City Repair Dept., 2100 West Broad St., F. Baptist, Purch. Agt.—
One tire bender.
One tire upsetter.
One woodworker's vise.
One set dies and stock 1 in. to 4 in.

**Mich., Detroit**—The Dept. of Purchases and Supplies, 710 Marquette Bldg., G. J. Finn, Purch. Agt.—
Three reciprocating grinders.
Four gasoline driven arc welding generators with all welding accessories.

**Mich., Detroit**—The Wheel Truing Brake Shoe Co., 219 Tuxedo Ave.—miscellaneous equipment for making brake shoes.

**O., St. Bernard** (Cincinnati P. O.)—The Jarecki Chemical Co., manufacturer of fertilizers, J. P. Allen, Purch. Agt.—one lathe 36 in. swing and 10 ft. bed, (second-hand).

**Wis., Beaver Dam**—H. Krueger—modern garage repair machinery.

**Wis., Luxembourg**—Spitzer & Diestelhorst, A. Spitzer, Purch. Agt.—machinery for garage repair department.

**Wis., West Allis**—J. Barnekow & Son, 87th and Greenfield Aves., J. Barnekow, Purch. Agt.—small drill press and lathe, suitable for garage repair work.

**Kan., Mulberry**—The Mulberry Fdry. and Machine Shop, G. Brickney, Supt.—foundry and machine shop equipment.

**Tex., San Antonio**—The Stroud Motor Manufacturing Assn., Ltd., 423-31 Gunter Bldg., R. B. Shoop, Ch. Engr.—small tool equipment and supplies for the manufacture of tractors.

**Cal., San Francisco**—S. Ward & Son, 170 1st St., (machine tools supplies)—1,500 lb. bore drop hammer.

**Ont., Toronto**—The Canadian-Libbey-Owens Sheet Glass Co., 241 Spadina Ave.—
One electric crane.
Box shop machines.
Machine shop tools, conveyors, etc. Full particulars furnished by the De Vore Eng. Co., Nicholas Bldg., Toledo, O.

## Machinery Wanted

**Md., Oakland**—The Oakland Laundry Co., A. S. Teats, Pres.—laundry machinery.

**N. Y., Buffalo**—E. R. Maltby Co. 938 Ellicott Sq., Bldg.—$50,000 worth of roofing paper machinery.

**N. C., Lexington**—The United Furniture Furniture Co., B. C. Philpot, Purch. Agt.—machinery for veneer and glue room.

**N. C., Wilmington**—Carters Production Wks., 210 South Water St., manufacturer of machinery, O. Carter, Purch. Agt.—20-24 ft. sawmill carriage and husk.

**Tenn., Mooresburg**—G. W. Bolinger—broom handle lathe for turning birch handles, machinery for the manufacture of brooms, plow handles and beams, (new or used).

**Va., Richmond**—W. M. Reynold, 1839 West Broad St.—machinery for electrical repair work, (used).

**Va., Roanoke**—The Roanoke Lumber & Mfg. Corp.—B. B. Irby, Pres. and Mgr.—general planing milling machinery.

**Wis., Wausau**—The Marathon Electric Mfg. Co., Plummer Island—machinery for the manuafcture of electric fans, etc.

**Wis., Eau Claire**—C. H. Hopson, 463 Summit Ave., manufacturer of tires—rubber working machinery and vulcanizing equipment.

**Wis., Peshtigo**—The Peshtigo Pulp & Paper Co.—10 ton crane.

**Wis., Amherst**—The Amherst Jersey Creamery and Dairy Co., F. Shanklin, Pres.—machinery for creamery and dairy.

**Ia., Des Moines**—M. L. Patzig, 206 11th St.—Universal testing machine, capacity 400,000 lb., for testing tensile compressive and transverse stresses, (new or used).

**Ont., Port Arthur**—The News Chronicle Co.—$10,000 worth of printing machinery.

**Ont., Toronto**—J. Inglis Co., Ltd., Strachan Ave., manufacturers of machinery—traveling cranes, jib cranes, etc.

## Metal Working

### NEW ENGLAND STATES

**Conn., Bridgeport**—G. T. McCarthy, 929 Ivanston Ave., has awarded the contract for the construction of a 1 story, 50 x 100 ft. garage. Estimated cost, $20,000.

**Conn., Hartford**—The Elm Garage, 93 Main St., will soon award the contract for the construction of a 1 story, 55 x 85 ft. garage on Park St. Estimated cost, $20,000. Private plans.

**Mass., Cohasset**—S. E. Ruiter plans to build a 1 story, 40 x 80 ft. addition to his garage on South Main St. G. F. Newton, 6 Beacon St., Boston, Archt.

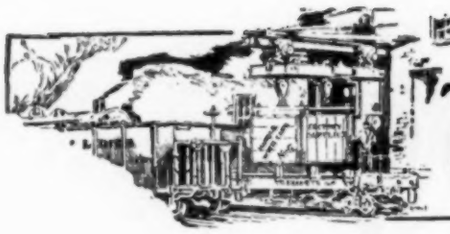
**Mass., Roxbury, (Boston, P.O.)**—T. H. Connolly, 110 Bower St., will soon award the contract for the construction of a 1 story, 120 x 145 ft. garage on Washington St. Estimated cost, $75,000. Tuck & Gilman, 34 School St., Boston, Archts. and Engrs. Noted Feb. 3.

**Mass., Malden (Boston P. O.)**—The Terminal Garage, 339 Main St., plans to build a 1 story garage, containing 10,000 sq.ft. floor space on Eastern and Main Sts. Estimated cost, $40,000. Probably private plans.

**Mass., New Bedford**—F. W. Greene, Jr., 252 Union St., will soon award the contract for the construction of a 1 story garage containing 8,500 sq.ft. floor space, on Ash St. Estimated cost, $35,000. La Brode & Bullard, 251 Union St., Archts., Noted Dec. 2.

**Mass., Worcester**—E. R. Bostwick, 25 Kingsbury St., is having plans prepared for the construction of a 1 story, 50 x 90 ft. garage. Estimated cost, $20,000. J. A. Jollette, 58 Front St., Archt.

**Vt., Springfield**—Gilman & Son, Inc., River St., are having plans prepared for the construction of a 2 or 3 story, 50 x 150 ft. machine shop. Brainerd, Leeds & Kellogg, 89 Franklin S., Boston Archts. Noted Dec. 23.



# THE WEEKLY PRICE GUIDE

## IRON AND STEEL

**PIG IRON**—Quotations compiled by The Matthew Addy Co.:

| | Current | One Year Ago |
|---|---|---|
| **CINCINNATI** | | |
| No. 2 Southern | $38.50 | $44.60 |
| Northern Basic | 34.50 | 42.80 |
| Southern Ohio No. 2 | 34.00 | 43.80 |
| **NEW YORK—Tidewater Delivery** | | |
| 2X Virginia (Silicon 2.25 to 2.75) | 40.41 | 47.65 |
| Southern No. 2 (Silicon 2.25 to 2.75) | 44.26 | 47.70 |
| **BIRMINGHAM** | | |
| No. 2 Foundry | 34.00 | 41.00 |
| **PHILADELPHIA** | | |
| Eastern Pa., No. 2x, 2.25–2.75 sil. | 36.00 | 45.35* |
| Virginia No. 2 | 40.00 | 43.25* |
| Basic | 34.00 | 43.00† |
| Grey Forge | 34.00 | 42.50* |
| **CHICAGO** | | |
| No. 2 Foundry local | 35.00 | 43.25 |
| No. 2 Foundry, Southern | 40.60 | 46.60 |
| **PITTSBURGH, including freight charge from Valley** | | |
| No. 2 Foundry | 36.96 | 43.65 |
| Basic | 31.96 | 42.90 |
| Bessemer | 33.96 | 43.40 |

* F.o.b. furnace. † Delivered.

**STEEL SHAPES**—The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses at the cities named:

| | New York | | | Cleveland | | Chicago | |
|---|---|---|---|---|---|---|---|
| | *Current | One Month Ago | One Year Ago | Current | One Year Ago | Current | One Year Ago |
| Structural shapes | $3.58 | $3.58 | $3.97 | $3.58 | $4.62 | $3.58 | $3.47 |
| Soft steel bars | 3.48 | 3.45 | 4.12 | 3.34 | 3.52 | 3.48 | 3.52 |
| Soft steel bar shapes | 3.48 | 3.45 | 4.12 | 3.48 | 3.82 | 3.48 | 3.52 |
| Soft steel bands | 4.18 | 4.18 | 4.82 | 6.25 | 5.25 | | |
| Tank plates | 3.78 | 3.78 | 4.17 | 3.78 | 5.00 | 3.78 | 3.67 |

*Add 10c. for trucking charge to Jersey City and 15c. to New York and Brooklyn from warehouse.

**BAR IRON**—Prices per 100 lb. at the places named are as follows:

| | Current | One Year Ago |
|---|---|---|
| Mill, Pittsburgh | $2.25 | $4.00 |
| Warehouse, New York | 3.53 | 3.52 |
| Warehouse, Cleveland | 3.52 | 3.42 |
| Warehouse, Chicago | 4.12 | 3.52 |

**SHEETS**—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

| Blue Annealed | Large Mill Lots Pittsburgh | New York *Current | New York One Year Ago | Cleveland | Chicago |
|---|---|---|---|---|---|
| No. 10 | 3.55 | 4.68 | 7.00 | 4.50 | 4.68 |
| No. 12 | 3.60 | 4.73 | 7.10 | 4.60 | 4.73 |
| No. 14 | 3.65 | 4.78 | 5.42 | 4.65 | 4.78 |
| No. 16 | 3.75 | 4.88 | 5.52 | 4.75 | 4.88 |
| Black | | | | | |
| Nos. 18 and 20 | 4.20 | 5.58 | 7.30 | 5.30 | 5.55 |
| Nos. 22 and 24 | 4.25 | 5.63 | 7.35 | 5.45 | 5.60 |
| No. 26 | 4.30 | 5.68 | 7.90 | 5.50 | 5.65 |
| No. 28 | 4.35 | 5.78 | 8.00 | 5.60 | 5.75 |
| Galvanized | | | | | |
| No. 10 | 4.70 | 6.13 | 6.90 | 5.95 | 6.10 |
| No. 12 | 4.80 | 6.23 | 6.95 | 6.05 | 6.20 |
| No. 14 | 4.80 | 6.23 | 7.10 | 6.05 | 6.20 |
| Nos. 18 and 20 | 5.10 | 6.63 | 7.40 | 6.35 | 6.50 |
| Nos. 22 and 24 | 5.25 | 6.78 | 7.80 | 6.50 | 6.65 |
| No. 26 | 5.40 | 6.93 | 7.95 | 6.65 | 6.83 |
| No. 28 | 5.70 | 7.13 | 9.00 | 7.95 | 7.10 |

**AUTOMOBILE SHEETS**—Patent level stock for automobile bodies and fenders. Prices in cents per pound for 100 lb. lots at warehouse, New York and Chicago—No. 16, 7.48; No. 18 20, 7.53; No. 22-24, 7.58.

*To these prices 10c. must be added for delivery in Jersey City and 15c. for New York and Brooklyn.

**COLD FINISHED STEEL**—Warehouse prices are as follows:

| | New York | Chicago | Cleveland |
|---|---|---|---|
| Round shafting or screw stock, per 100 lb. base | $5.50 | $5.25 | $4.84 |
| Flats, square and hexagons, per 100 lb. base | 6.00 | 5.75 | 5.34 |

**DRILL ROD—Discounts** from list price are as follows at the places named:

| | Per Cent |
|---|---|
| New York | 50 |
| Cleveland | 50 |
| Chicago | 50 |

**NICKEL AND MONEL METAL**—Base prices in cents per pound any quantities, f.o.b. Bayonne, N. J.

| Nickel | |
|---|---|
| Ingot and shot | 43 |
| Electrolytic | 45 |

| Monel Metal | | | |
|---|---|---|---|
| Shot and blocks | 35 | Hot rolled rods (base) | 42 |
| Ingots | 38 | Cold rolled rods (base) | 56 |
| Sheet bars | 40 | Hot rolled sheets (base) | 55 |
| **Special Nickel and Alloys** | | | |
| Malleable nickel ingots | 45 | | |
| Malleable nickel sheet bars | 47 | | |
| Hot rolled rods, Grades "A" and "C" (base) | 60 | | |
| Cold drawn rods, grades "A" and "C" (base) | 72 | | |
| Copper nickel ingots | 42 | | |
| Hot rolled copper nickel rods (base) | 52 | | |
| Manganese nickel hot rolled (base) rods, "D"—low manganese | 64 | | |
| Manganese nickel hot rolled (base) rods "D"—high manganese | 67 | | |

**Domestic Welding Material (Swedish Analysis)**—Welding wire in 100-lb. lots sells as follows, f.o.b. New York: 5/32, 8½c. per lb.; ⅛, 8c.; 5/32 to ¼, 7½c. Domestic iron sells at 12c. per lb.

**MISCELLANEOUS STEEL**—The following quotations in cents per pound are from warehouse at the places named:

| | New York Current | Cleveland Current | Chicago Current |
|---|---|---|---|
| Openhearth spring steel (heavy) | 6.50 | 8.00 | 9.00 |
| Spring steel (light) | 10.00 | 7.00 | 12.00 |
| Coppered bessemer rods | 9.00 | 8.00 | 7.00 |
| Hoop steel | 4.58 | 4.04 | 4.18 |
| Cold-rolled strip steel | 9.00 | 8.25 | 9.25 |
| Floor plates | 5.75 | 4.00 | 6.03 |

**WROUGHT PIPE**—The following discounts are to jobbers for carload lots on the Pittsburgh basing card:

BUTT WELD

| Steel Inches | Steel Black | Steel Galvanized | Iron Inches | Iron Black | Iron Galvanized |
|---|---|---|---|---|---|
| ⅛ to 3 | 57½% | 44% | ⅛ | 15½–16½% | +10½–11½% |
| | | | ¼ | 19½–20½% | 1½– 2½% |
| | | | ⅜ to 1½ | 24½–25½% | 8½– 9½% |

LAP WELD

| | | | | | |
|---|---|---|---|---|---|
| 2 | 50½% | 38% | 2 | 20½–21% | 6½– 7% |
| 2½ to 6 | 53½% | 41% | 2½ to 6 | 22½–23% | 9½–10% |
| 7 to 12 | 50½% | 37% | 7 to 12 | 19½–20% | 6½– 7% |
| 13 to 14 | 41% | | | | |
| 15 | 38½% | | | | |

BUTT WELD, EXTRA STRONG PLAIN ENDS

| | | | | |
|---|---|---|---|---|
| ⅛ to 1½ | 55½% | 43% | ¼ to 1½ | 24½–25½% | 9½–10½% |
| 2 to 3 | 56½% | 44% | | | |

LAP WELD, EXTRA STRONG, PLAIN ENDS

| | | | | | |
|---|---|---|---|---|---|
| 2 | 48½% | 37% | 2 | 21½–22½% | 8½– 9% |
| 2½ to 4 | 51½% | 40% | 2½ to 4 | 23½–24% | 11½–12% |
| 4½ to 6 | 50½% | 39% | 4½ to 6 | 22½–23% | 10½–11% |
| 7 to 8 | 46½% | 33% | 7 to 8 | 14½–15% | 2½– 3% |
| 9 to 12 | 41½% | 28% | 9 to 12 | 9½–10% | +2 –2½% |

Warehouse discounts as follows:

| | New York Black | New York Galv. | Cleveland Black | Cleveland Galv. | Chicago Black | Chicago Galv. |
|---|---|---|---|---|---|---|
| ⅛ to 3 in. steel butt welded | 44% | 28% | 42½% | 33½% | 57½% | 44% |
| 2½ to 6 in. steel lap welded | 39% | 24% | 44½% | 29½% | 53½% | 41% |

Malleable fittings. Classes B and C, banded, from New York stock sell at plus 6%. Cast iron, standard sizes, 15% off.

## METALS

**MISCELLANEOUS METALS**—Present and past New York jobbers' quotations in cents per pound, in quantities up to car lots:

| | Current | Month Ago | Year Ago |
|---|---|---|---|
| Copper, electrolytic | 13.75@14.00 | 15.00 | 19.00 |
| Tin in 5-ton lots | 32.00 | 34.25 | 60.00 |
| Lead | 5.25 | 5.37½ | 9.00 |
| Zinc | 5.87½ | 7.00 | 9.50 |
| **ST. LOUIS (In carload lots)** | | | |
| Lead | 4.85 | 5.25 | 8.375 |
| Zinc | 4.47½ | 6.75 | 9.225 |

At the places named, the following prices in cents per pound prevail, for 1 ton or more:

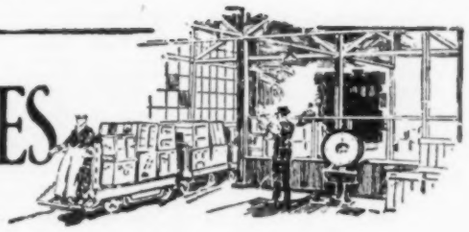
| | New York Current | New York Month Ago | New York Year Ago | Cleveland Current | Cleveland Year Ago | Chicago Current | Chicago Year Ago |
|---|---|---|---|---|---|---|---|
| Copper sheets, base | 21.00 | 22.50 | 29.50 | 23.00 | 31.00 | 24.25 | 36.00 |
| Copper wire (carload lots) | 16.00 | 17.00 | 29.25 | 19.00 | 29.50 | 24.00 | 27.00 |
| Brass sheets | 18.75 | 20.25 | 26.50 | 24.00 | 29.00 | 26.50 | 27.00 |
| Brass pipe | 23.50 | 25.00 | 32.00 | 25.00 | 34.00 | 21.50 | 35.00 |
| Solder (half and half) (case lots) | 22.50 | 27.75 | 39.00 | 26.00 | 40.50 | 21.00 | 38.00 |

Copper sheets quoted above hot rolled 24 oz., cold rolled 14 oz. and heavier add 2c.; polished takes 5c. per sq.ft. extra for 20-in. widths and under; over 20 in., 7½c.

**BRASS RODS**—The following quotations are for large lots, mill, 1,000 lb. and over, warehouse; net extra:

| | Current | One Year Ago |
|---|---|---|
| New York | 16.75 | 23.75 |
| Cleveland | 20.00 | 29.00 |
| Chicago | 21.25 | 26.00 |

# SHOP MATERIALS AND SUPPLIES



**ZINC SHEETS**—The following prices in cents per pound are f.o.b. mill + less 8% for carload lots..... 11.50

| | Warehouse | | | |
|---|---|---|---|---|
| | In Casks | | Broken Lots | |
| | Current | One Year Ago | Current | One Year Ago |
| Cleveland | 13.70 | 15.00 | 14.30 | 15.50 |
| New York | 12.50 | 14.00 | 13.50 | 14.50 |
| Chicago | 14.50 | 15.00 | 14.95 | 15.00 |

**ANTIMONY**—Chinese and Japanese brands in cents per pound, in ton lots for spot delivery, duty paid:

| | Current | One Year Ago |
|---|---|---|
| New York | 6.00 | 11.25 |
| Chicago | 6.50 | 12.50 |
| Cleveland | 7.50 | 13.00 |

**OLD METALS**—The following are the dealers' purchasing prices in cents per pound:

| | *New York | | | |
|---|---|---|---|---|
| | Current | One Year Ago | Cleveland | Chicago |
| Copper, heavy, and crucible | 11.50 | 17.00 | 10.00 | 10.50 |
| Copper, heavy, and wire | 11.00 | 16.50 | 9.50 | 9.00 |
| Copper, light, and bottoms | 9.00 | 15.50 | 9.00 | 8.00 |
| Lead, heavy | 4.00 | 7.00 | 4.00 | 3.75 |
| Lead, tea | 3.00 | 6.25 | 3.00 | 3.00 |
| Brass, heavy | 7.00 | 12.00 | 7.00 | 10.00 |
| Brass, light | 5.50 | 9.50 | 5.00 | 5.50 |
| No. 1 yellow brass turnings | 6.00 | 10.00 | 5.50 | 6.00 |
| Zinc | 4.00 | 6.25 | 3.00 | 3.50 |

* These prices nominal because of dull market.

**ALUMINUM**—The following prices are spot from warehouse at places named:

| | New York | Cleveland | Chicago |
|---|---|---|---|
| No. 1 aluminum, 98 to 99% pure, in ingots for remelting (1-15 ton lots), per lb. | 28.2@28.1 | 24.50 | 33.50 |

**COPPER BARS**—From warehouse sell as follows in cents per pound, for ton lots and over:

| | Current | One Year Ago |
|---|---|---|
| New York (round) | 23.50 | 33.00 |
| Chicago | 24.50 | 29.00 |
| Cleveland | 22.00 | 32.00 |

**BABBITT METAL**—Warehouse price per pound:

| | New York | | Cleveland | | Chicago | |
|---|---|---|---|---|---|---|
| | Current | One Year Ago | Current | One Year Ago | Current | One Year Ago |
| Best grade | 70.00 | 70.00 | 46.00 | 70.00 | 35.00 | 70.00 |
| Commercial | 30.00 | 30.00 | 16.50 | 20.00 | 9.00 | 15.00 |

NOTE—Price of babbitt metal is governed largely by formula, no two manufacturers quoting the same prices. For example, in New York, we quote the best two grades, although lower grades may be obtained at much lower prices.

## SHOP SUPPLIES

**NUTS**—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

| | New York | | Cleveland | | Chicago | |
|---|---|---|---|---|---|---|
| | Current | One Year Ago | Current | One Year Ago | Current | One Year Ago |
| Hot pressed square | List | +$2.00 | $1.00 | $1.00 | +1.15 | 1.25 |
| Hot pressed hexagon | List | +2.00 | 1.00 | 1.00 | +1.15 | 1.25 |
| Cold punched hexagon | List | +2.00 | 1.00 | 1.00 | +1.15 | .90 |
| Cold punched square | List | +2.00 | 1.00 | 1.00 | +1.15 | .90 |

Semi-finished nuts, 5/16 and smaller, sell at the following discounts from list price:

| | Current | One Year Ago |
|---|---|---|
| New York | 60% | 60% |
| Chicago | 70% | 50% |
| Cleveland | 70% | 60–10% |

**MACHINE BOLTS**—Warehouse discounts in the following cities:

| | New York | Cleveland | Chicago |
|---|---|---|---|
| All sizes up to 1 by 30 in. | 45% | 60% | 50% |
| 1½ and 1¼ in. by 3 in. up to 12 in. | 25% | 50% | 45% |

**WASHERS**—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:

New York....$4.50 Cleveland....$3.50 Chicago....$2.50

For cast-iron washers, 5/8 and larger, the base price per 100 lb. is as follows:

New York....$6.00 Cleveland....$4.00 Chicago....$4.50

**CARRIAGE BOLTS**—From warehouses at the places named the following discounts from list are in effect:

| | New York | Cleveland | Chicago |
|---|---|---|---|
| ½ by 6 in. and smaller | +40% | 50% | 40% |
| Larger and longer up to 1 in. by 30 in. | +40% | 40% | 40% |

**COPPER RIVETS AND BURS** sell at the following rate from warehouse:

| | Rivets | | Burs | |
|---|---|---|---|---|
| | Current | One Year Ago | Current | One Year Ago |
| Cleveland | 35% | 20% | 10% | 30% |
| Chicago | net | 10% | net | 10% |
| New York | 50% | 10% | 25% | 10% |

**RIVETS**—The following discounts are allowed for fair-sized orders from warehouse:

| | New York | Cleveland | Chicago |
|---|---|---|---|
| Steel 7/16 and smaller | 45% | 50% | 45% |
| Tinned | 45% | 50% | 30% |

Structural, ½, ⅞, 1 in. diameter by 2 to 5 in. sell as follows per 100 lb.:

New York...$5.20 Cleveland..$5.00 Chicago....$5.08 Pittsburgh..$3.90

Boiler, same sizes:

New York...$5.30 Cleveland..$5.10 Chicago....$5.18 Pittsburgh..$4.00

## MISCELLANEOUS

**SEAMLESS DRAWN TUBING**—The base price in cents per pound from warehouse in 100-lb. lots is as follows:

| | New York | Cleveland | Chicago |
|---|---|---|---|
| Copper | 24.50 | 27.00 | 29.00 |
| Brass | 23.50 | 24.00 | 28.00 |

Prices vary with the quantity purchased. For lots of less than 100 lb., but not less than 75 lb., the advance is 1c.; for lots of less than 75 lb., but not less than 50 lb., 2½c. over base (100-lb. lots); less than 50 lb., but not less than 25 lb., 5c. should be added to base price; quantities less than 25 lb. add 10c. per lb.

Double above extras will be charged for angles, channels and sheet metal mouldings if ordered in above quantities. Above extras also apply to brass rod other than standard stock sizes—stock sizes being considered as ½-2 in. inclusive in rounds, and ½-1½ in., inclusive, in square and hexagon—all varying by thirty seconds up to 1 in. by sixteenths over 1 in. On shipments aggregating less than 100 lb., there is usually a boxing charge of $.75.

**LONG TERNE PLATE**—In Chicago No. 28 primes from stock sell, nominally, for $7.50 per 100 lb.

In Cleveland—$8.50 per 100 lb.; New York price is 8@8½c.

**COTTON WASTE**—The following prices are in cents per pound:

| | New York | | | |
|---|---|---|---|---|
| | Current | One Year Ago | Cleveland | Chicago |
| White | 7.50@13.00 | 13.00 | 13.00 | 14.25 |
| Colored mixed | 7.00@11.00 | 9.00–12.00 | 10.00 | 12.00 |

**WIPING CLOTHS**—Jobbers' price per 1,000 is as follows:

| | 13½x13⅛ | 13½x20½ |
|---|---|---|
| Cleveland | 55.00 | 65.00 |
| Chicago | 41.00 | 43.50 |

**SAL SODA** sells as follows per 100 lb.:

| | Current | One Month Ago | One Year Ago |
|---|---|---|---|
| New York | $2.25 | $2.00 | $2.25 |
| Philadelphia | 2.00 | 2.75 | 2.00 |
| Cleveland | 3.25 | 4.00 | 2.50 |
| Chicago | 2.50 | 2.75 | 2.00 |

**ROLL SULPHUR** in 360-lb. bbl. sells as follows per 100 lb.

| | Current | One Month Ago | One Year Ago |
|---|---|---|---|
| New York | $2.70 | $3.50 | $3.40 |
| Philadelphia | 3.65 | 3.65 | 4.25 |
| Chicago | 4.50 | 4.00 | 5.00 |

**COKE**—The following are prices per net ton at ovens, Connellsville:

| | Current | One Month Ago | One Year Ago |
|---|---|---|---|
| Prompt furnace | $5.00@$5.50 | $5.00@$5.50 | $6.00 |
| Prompt foundry | 6.00@6.50 | 6.25@7.00 | 7.00 |

**FIRE CLAY**—The following prices prevail:

| | | Current |
|---|---|---|
| Ottawa, bulk in carloads | Per Ton | $8.00 |
| Cleveland | 100-lb. bag | 1.00 |

**LINSEED OIL**—These prices are per gallon:

| | New York | | Cleveland | | Chicago | |
|---|---|---|---|---|---|---|
| | Current | One Year Ago | Current | One Year Ago | Current | One Year Ago |
| Raw in barrels, (5 bbl. lots) | $0.77 | $1.80 | $0.90 | $2.00 | $0.84 | $1.98 |
| 5-gal. cans | 1.00 | 2.00 | 1.15 | 2.25 | 1.09 | 2.23 |
| 1-gal. cans (2 to case) | 1.00 | .... | .... | .... | .... | .... |

**WHITE AND RED LEAD**—Base price per pound:

| | Red | | | | White | |
|---|---|---|---|---|---|---|
| | Current | | One Year Ago | | Current | One Year Ago |
| | Dry | In Oil | Dry | In Oil | Dry and In Oil | Dry and In Oil |
| 100 lb. keg | 13.00 | 14.50 | 15.00 | 16.50 | 13.00 | 15.00 |
| 25 and 50-lb. kegs | 13.25 | 14.75 | 15.25 | 16.75 | 13.25 | 15.25 |
| 12½-lb. keg | 13.50 | 15.00 | 15.50 | 17.00 | 13.50 | 15.50 |
| 5-lb. cans | 16.00 | 17.50 | 17.00 | 18.50 | 16.00 | 17.00 |
| 1-lb. cans | 18.00 | 19.50 | 18.00 | 19.50 | 18.00 | 18.00 |

500 lb. lots less 10% discount. 2,000 lb. lots less 10-4% discount. 10,000 lb. lots less 10-7½% discount.

### MIDDLE ATLANTIC STATES

**Md., Baltimore**—The Carter Type Machine Co., Industrial Bldg., plans to build a 75 x 150 ft. plant for the manufacture of type casting machines. N. Keen, Pres.

**N. Y., Dunkirk**—The Commercial Machine Co. 35 West Front St., will build a 1 story, 47 x 157 ft. factory. Estimated cost, $20,000.

**N. Y., Hudson**—The Holbrook Co., 67th St. and West End Ave., New York City, has awarded the contract for the construction of a 1 story, 100 x 260 ft. factory, here, for the manufacture of auto bodies.

**N. Y., New York** (Borough of Brooklyn)—J. E. Albright, 282 Stuyvesant Ave., has awarded the contract for the construction of a 1 story, 99 x 100 ft. garage on Atlantic Ave. Estimated cost, $13,000.

**N. Y., New York** (Borough of Brooklyn)—W. M. Currie, 70-4 Adams St., Machinist has awarded the contract for altering and extending his plant. Estimated cost, $10,000.

**N. Y., New York** (Borough of Brooklyn)—The Liberty Wyona Co., Inc., 1199 Eastern Parkway, is having plans prepared for the construction of a 1 story, 128 x 167 ft. garage on Flatbush Ave. Estimated cost, $40,000. C. Goodman, 375 Fulton St., Archt.

**N. Y., New York** (Borough of Brooklyn)—E. L. Megill, 60 Devore St., is having plans prepared for the construction of a 2 story, 40 x 40 ft. factory on Atlantic Ave. and Adelphi St., for the manufacture of metal novelties. Gilbert & Ashfield, 350 Fulton St., Archts. and Engrs.

**N. Y., New York (Borough of Brooklyn)**—The Parkside Improvement Corp., care of B. Dreisler, Jr., Archt., 153 Remsen St., will build a 1 story, 100 x 125 ft. garage on 49th St. near 2nd Ave. Estimated cost, $50,000.

**N. Y, New York** (Borough of Brooklyn)—H. Proacci, 19th St. and 3rd Ave., will soon award the contract for the construction of a 1 story, 51 x 68 ft. garage on 19th St. and 3rd Ave. Estimated cost, $16,000. D. A. Lucas, 98th St. and 3rd Ave., Archt.

**N. Y., New York** (Borough of Brooklyn)—J. J. Sullivan, 570 Hamilton Ave., will soon award the contract for the construction of a 1 story, 85 x 200 ft. garage on Degrew St. Estimated cost, $50,000. E. K. Adolsohn, 1778 Pitkin Ave., Archt.

**N. Y., Long Island City**—The Interstate Land Holding Co., 44 Wall St., New York City, has awarded the contract for the construction of a 1 story, 70 x 100 ft. garage on Vernon Ave., here. Estimated cost, $40,000. J. Larkin, Pres.

**Pa., Philadelphia**—M. Poley, 2523 North 17th St., is having plans prepared for the construction of a 1 story, 45 x 55 ft. and 25 x 92 ft. furniture shop and garage on Livingston, Belgrade and Albert Sts. I. W. Levin, Mutual Life Bldg., Archt.

**Pa., Philadelphia**—J. Topp, 10 Delancy St., has awarded the contract for the construction of a 2 story, 22 x 60 ft. garage. Estimated cost, $10,000.

### SOUTHERN STATES

**Fla., De Land**—The Buick Garage is building a 60 x 196 ft. garage.

**Tenn., Memphis**—The Ideal Tractor Cultivator Co., McCall Bldg., has purchased a plant and plans to remodel same for the manufacture of farm tractor. R. F. Carr, Pres.

**Va., Alexandria**—The Bureau of Yards & Docks, Navy Dept., Wash., D. C., plans to alter plating shop and cafeteria, here. Estimated cost, $28,000.

**Va., Durmid**—The United Cigarette Machine Co. has awarded the contract for the construction of a 2 story, 52 x 145 ft. addition to its plant, for the manufacture of cigarette machinery. Estimated cost, $40,000.

**W. Va., Wheeling**—The Twelfth Street Garage Co., c/o C. W. Bates, Archt., 77 14th St., will soon award the contract for the construction of a 5 story, 82 x 125 ft. garage on 12th and Main Sts. Estimated cost $150,000.

### MIDDLE WEST STATES

**O., Cleveland**—The Electrical Steel & Forge Co., 6600 Grant Ave., is having plans prepared for the construction of a 1 story rolling mill. Estimated cost, $200,000. J. H. Foster, Pres. J. H. Herron & Co., 1360 West 3rd St., Engrs. and Archts.

**O., Cleveland**—I. Fergenbaum, 704 Ullmer Bldg., plans to build a 6 story, 80 x 175 ft. garage and display room at 3142 Prospect Ave. Estimated cost, $200,000.

**O., Cleveland**—The Hares Motors Ohio Co., 6545 Carnegie Ave., plans to build a 2 story garage and salesroom on Euclid Ave. Estimated cost, $75,000. R. J. Coach, Pres. Architect not selected.

**O., Cleveland**—The Natl. Acme Co., East 131st St. and Coit Rd., manufacturer of machinery, is having plans prepared for the construction of a 3 story factory. Estimated cost, $200,000. A. Walker, Supt. of construction. Private plans.

**O., Columbus**—The Packard Columbus Co., 3rd and Spring Sts., has awarded the contract for the construction of a 2 story, 60 x 180 ft. salesroom and service station, on East Broad St. stimated cost, $125,000.

**Mich., Detroit**—The Wheel Truing Brake Shoe Co., 219 Tuxedo Ave., will soon award the contract for the construction of a 2 story, 50 x 90 ft. factory. Estimated cost, $50,000. Kasurin Bros., 512 Empire Bldg., Archts.

**Wis., Wausaw**—W. R. Chellis, 407 McClellan St., plans to build a 4 story, 60 x 125 ft. factory for the manufacture of butcher block scrapers. Estimated cost, $100,000. Architect not selected.

### WEST OF THE MISSISSIPPI

**Kan., Mulberry**—The Mulberry Fdry. and Machine Shop has had preliminary plans prepared for the construction of a 1 story, 75 x 100 ft. foundry and machine shop. Estimated cost, $75,000. C. Brickney, Supt. G. J. Munn, 307 West 7th St., Pittsburg, Archt.

**Mo., St. Louis**—The Power Truck & Tractor Co., c/o P. G. Craven, Agt., Central Natl. Bank Bldg., will soon award the contract for the construction of a 1 story, 50 x 300 ft. truck and tractor factory on Goodfellow Ave., along the tracks of the Wabash R.R. Estimated cost, $40,000. W. S. Frank, c/o Hunkins-Willis Lime and Cement Co., Century Bldg., Archt.

**Tex., El Paso**—The Hill Sutton Co. plans to build a 1 story, 85 x 150 ft. plant for the manufacture of sheet metal wares. Estimated cost, $20,000.

### WESTERN STATIONS

**Cal., Stockton**—The Kroyer Motors Co. is building a 90 x 440 ft. plant, which is the first unit of a large plant. H. P. Cowley, Mgr.

### CANADA

**Ont., Toronto**—The J. Inglis Co., Ltd., Strachan Ave., manufacturers of machinery, plans to build a 1 story foundry. Estimated cost, $250,000.

## General Manufacturing

### NEW ENGLAND STATES

**Conn., Danbury**—The Beaver Brook Paper Mills, Inc., Beaver Brook Rd., will soon award the contract for the construction of a 1 story, 75 x 150 ft. addition to its plant. Estimated cost, $25,000. Sunderland & Watson, 248 Main St., Archts. Noted Jan. 13.

**Conn., Harfford**—The Acme Bedding Co., Inc., 94 Brown St., will soon award the contract for the construction of a 1 story, 40 x 60 ft. addition to its plant. Estimated cost, $8,000. G. Zunner, 182 High St., archt.

**Conn., New Britain**—E. R. Hitchcock & Co. 303 Main St. plans to build a 3 story, 45 x 100 ft. printing and binding plant. Private plans.

**Me., Portland**—The W. Underwood Co., 52 Fulton St., Boston, is having plans prepared for the construction of a 6 story, 60 x 120 ft. factory, here, to be used for the packing and canning of meats and fish. Estimated cost, $150,000. Monks & Johnson, 99 Chauncy St., Boston, Archt. and Engrs.

**Mass., Danvers Junction** (Danvers P. O.)—H. P. Gifford, c/o Salem Five Cent Savings Bank, Salem, plans to build a cold storage plant, here. Architect not selected.

### MIDDLE ATLANTIC STATES

**Md., Baltimore**—The Bugle Coat & Apron Co., 112 South Gay St., has purchased a site and plans to build a laundry.

**Md., Oakland**—The Oakland Laundry Co., recently incorporated with $10,000 capital stock plans to build a 30 x 80 ft. laundry. Estimated cost, $5,000. A. S. Teats, Pres.

**N. J., Newark**—Barrasso & Biasi, South St., will soon award the contract for the construction of a 2 story factory on Governor St. and Marion Pl., for the manufacture of jewelry. Estimated cost, $75,000. F. Grad, 145 Springfield Ave., Archt. and Engr.

**N. Y., Buffalo**—The Natl. Biscuit Co., 409 West 15th St., New York City, plans to build a bakery along the tracks of the New York Central R.R. belt line between Ferguson and Urban Sts., here. Estimated cost, $1,000,000. J. G. Zeller, Vice Pres.

**N. Y., New York** (Borough of Bronx)—The Keystone Tire & Rubber Co. is having plans prepared for the construction of a 2 story, 100 x 100 ft. factory on East 172nd St. Estimated cost, $100,000. F. Suton, 140 Cedar St., New York City, Engr. and Archt.

**N. Y., North Tonawanda**—E. R. Maltby Co., 938 Ellicott Sq., Buffalo, N. Y., will soon receive bids for the construction of a 1 story, 75 x 100 ft., 60 x 100 ft. and 40 x 100 ft. factory on Erie Ave. here, for the manufacture of roofing products. Estimated cost, $125,000.

**N. Y., Buffalo**—The Marine Laundry, 93 Elk St., will soon award the contract for the construction of a 1 story, 72 x 100 ft. laundry. C. E. Reynolds, 1691 Abbott Rd., Archt.

**N. Y., Lockport**—The Lockport Co-operative Dairy Assn. is having plans prepared for the construction of a 2 story, 40 x 80 ft. addition to its dairy. H. W. Dale, Pres. Miller & McNeil, 80 West Genessee St., Archts.

**N. Y., New York** (Borough of Brooklyn)—The Monsoon Cooling System, Inc., 70 West 45th St., New York City, plans to build a 2 story factory, containing 6,000 sq.ft floor space, at 71 North 6th St, here, for the manufacture of blowers. J. F. Daly, Pres.

**N. Y., New York** (Borough of Bronx)—The Superior Fireproofing Door and Sash Co., 1811 Carter Ave., will soon award the contract for the construction of a 1 story, 63 x 140 ft. factory. Estimated cost, $15,000. W. J. Meyer, 1861 Carter Ave., Archt.

**Pa. Pittsburgh**—The Methodist Episcopal Church Union of Pittsburgh, 6th and Smithfield Sts., will soon award the contract for the construction of a 47 x 100 ft. good will industrial building on 28th St. and Liberty Ave. Estimated cost, $100,000. T. B. and L. Wolf, Century Bldg., Archt. Noted Nov. 25.

### SOUTHERN STATES

**Fla., Campbellton**—The Kelly Foshee Lumber Co., Montgomery, Ala., plans to build a saw-mill here.

**Fla., Milton**—C. Y. Mayo, Jr., plans to build a sawmill.

**Ga., Vienna**—The Barfield Lumber Co. will build a 50 x 250 ft. ft. plant.

**N. C., Charlotte**—The Southern Ice Machine Co. plans to build a 75 x 140 ft. plant. F. A. Owens, 205 South Poplar St., Pres. and Mgr.

### MIDDLE WEST STATES

**O., Canton**—The Wilson Rubber Co., 1216 Garfield Ave. S. W., plans to build a 3 story, 50 x 100 ft. addition to its factory. Estimated cost, $160,000.

**O., Cleveland**—The Arnold Woodenware Co., 1369 West 9th St., will soon award the contract for the construction of a 2 story, 60 x 180 ft. factory on West 53rd St. and Detroit Ave. Estimated cost, $90,000. C. W. Hopkinson, 900 Rose Bldg., Archt. Noted Jan. 6.

**O., Greenville**—The Franklin Tractor Co. plans to build a 2 story, 50 x 120 ft. addition to its plant. Estimated cost, $50,000. Architect is not selected.

**O., Columbus**—The Iron Clay Brick Co., 64 Ruggery Bldg., has awarded the contract for the construction of a 1 story, 60 x 175 ft. factory on East 2nd Ave. Estimated cost, $45,000.

**Wis., Amherst**—The Amherst Jersey Creamery and Dairy Co., plans to build a 5 story, 50 x 110 ft. creamery and dairy on Main St. Estimated cost, $75,000. F. Shanklin, Pres. Architect not selected.

**Wis., Racine**—The Journal Printing Co., 328 Main St., has awarded the contract for the construction of a 2 story, 60 x 110 ft. publishing plant on 4th St. Estimated cost, $110,000.